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ABSTRACT

This report presents the results of a survey conducted with first-, third-, fifth-, and seventh-grade teachers in Delaware, New Jersey, and Pennsylvania. Four classroom process constructs (opportunity, motivators, structure, and instructional events) are used as organizers to present survey responses on classroom processes. In addition, information on teachers' uses of and attitudes toward the hand-held calculator is given. (MK)

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A SURVEY OF CLASSROOM PRACTICES IN MATHEMATICS: REPORTS OF FIRST, THIRD, FIFTH AND SEVENTH GRADE TEACHERS IN DELAWARE, NEW JERSEY, AND PENNSYLVANIA

Submitted to
National Institute of Education

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TABLE OF CONTENTS

Page

I. Introduction 1
   Development of the Questionnaire 2
   Procedure of the Study 4
   Limitations of the Study 8
   Organization of the Report 9
II. Opportunity 10
   Time . . . .
   Criterion Relevant Instruction 18
III. Motivators 27
   Curriculum Motivators 27
   Interpersonal Motivators. 33
IV. Structure and Placement 35
   Instructional Objectives 35
   Grouping 41
   Matching 47
V. Instructional Events 51
   Classroom Management 51
VI. Professional Opportunities for Teachers 53
VII. Teachers Uses of and Attitudes Toward Uses of the Hand-Held Calculator 57
VIII. Summary and Recommendations 66
   The Survey in Retrospect 66
   Summary 67
   Recommendations 71
Appendix A: Research for Better Schools Math Classroom Questionnaire 72
Appendix B: Distribution of the Questionnaires. 85
Appendix C: Letters to Principals and Teachers 93
Appendix D: Structured Interview Instruments, Distribution of Interviews 96
Appendix E: Commercial Texts and Tests Reported In Use . . . 107
Appendix F: Teachers' Comments on Suggested Uses of the Hand-Held Calculator 121

I. INTRODUCTION

Whether the reader wishes to consider 1977 as the beginning of the third decade of "modern mathematics," the middle of the first decade of the back-to-basics movement, or the dawning of the age of the hand-held calculator in the classroom, classroom practices reported by teachers may serve to help those attempting to assess the impact of the forces and issues shaping elementary mathematics education as well as those who are planning programs to impact mathematics education. This study by Research for Better Schools, funded by The National Institute of Education, presents information about mathematics classroom practices reported by first, third, fifth, and seventh grade teachers in Delaware, New Jersey, and Pennsylvania.

The 1975 Euclid Conference Report contains several requests for the collection of information on classroom practices.[1] The 1975 NACOME report also conveyed a sense of the need for information on the status of elementary mathematics education:

> Extensive and detailed information about classroom practice is an urgent need. The status of mathematical education can certainly not be known until we have far more dependable data on what actually happens in the classroom. Any attempt to link cause to the assessed effects of testing programs is suspect until such information is available.[2]

Included in the "Report of the Conference on Needed Research and Development on Hand-Held Calculators in School Mathematics" is the following recommendation: "Current instructional practices should be studied to determine what actually happens in school mathematics classrooms."[3]

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[1] Volume II: Working Group Reports, Conference on Basic Mathematical Skills and Learning (Washington, D. C.: National Institute of Education, 1975), p. 14.

[2] Conference Board of the Mathematical Sciences, Overview and Analysis of School Mathematics Grades K-12 (Washington, D. C.: National Advisory Committee on Mathematical Education, 1975), p. 144.

What is going on in the mathematics classroom? A "first look at the typical mathematics classroom"[4] is provided by a 1975 NCTM sponsored survey of second and fifth grade teachers. Some of the results of that nationwide survey are presented in the NACOME report.[5] It is hoped that the data presented in this report, together with the aforementioned NCTM sponsored survey, will establish some baseline data and will permit future surveys to focus on other areas of concern, to establish details of certain classroom practices, and/or to relate classroom practices to student outcomes.

Development of the Questionnaire

The original plans for this study called for RBS to distribute in Delaware, Pennsylvania, and New Jersey the same questionnaire used in the NCTM survey.[6] However, after reviewing the questionnaire, it was felt that while most of the data on teacher characteristics was available from state projects such as Pennsylvania's Educational Quality Assessment (EQA) program, other classroom practices, such as those identified in the Cooley-Lohnes model,[7] while not covered by items on the NCTM questionnaire, were of significant interest. Also, prior to beginning revisions on the NCTM questionnaire, conversations with Edward Esty of NIE and with James T. Fey of NACOME led us to consider the addition of items intended to assess teachers' attitudes toward hand-held calculators and the extent to which hand-held calculators are used in math classrooms. Also, Iris R. Weiss shared with us copies of the Research Triangle Institute questionnaires that were about to be released to gather data for a National Science Foundation sponsored survey of mathematics education.[8] Our own interest in diagnosis and prescription prompted us to obtain copies of Linda Oldaker's "Diagnostic/Prescriptive Interview Instrument."[9] Without question, the RBS questionnaire was influenced both in terms of content and format by these two instruments.

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[3] Report of the Conference on Needed Research and Development on Hand-Held Calculators in School Mathematics (Washington, D. C.: National Science Foundation and The National Institute of Education, 1976), p. 17.

[4] Jack Price, Jonathan Kelley, and John L. Kelley, " 'New Math' Implementation: A Look Inside the Classroom," (n.p.,: The National Council of Teachers of Mathematics,,August, 1975), p. 1.

[5] Conference Board of the Mathematical Sciences, op. cit., pp. 68-78.

[6] Jack Price, Jonathan Kelley, and John L. Kelley, "Questionnaire," (Washington, D. C.: The National Council of Teachers of Mathematics, February, 1975).

[7] William W. Cooley and Paul R. Lohnes, Evaluation Research in Education (New York: Irvington Publishers, Inc., 1976).

Numerous editions of the questionnaire were developed, critiqued and edited within RBS. A draft was then sent for review by three mathematics educators, one from each of the states to be surveyed. We appreciate the comments of Dr. William Geppert, State Supervisor of Mathematics in Delaware; Ms. Christine Blake, Mathematics Coordinator in Camden, New Jersey; and, Dr. Alexander Tobin, Director of Mathematics Education for the School District of Philadelphia. Their comments as well as those of Edward Esty of NIE resulted in minor revisions in directions, in the addition of several items, and the revisions of some options on several multiple choice items.

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[8] Research Triangle Institute, "Elementary Teacher Questionnaire -- Mathematics" and "Secondary Teacher Questionnaire -- Mathematics," (Research Triangle Park, North Carolina: Research Triangle Institute, 1976).

[9] Linda Oldaker, "Diagnostic/Prescriptive Interview Instrument," in "A Study of the Mathematics Clinic as a Clinical Approach to Inservice," (unpublished doctoral dissertation, Arizona State University, Tempe, 1976), Appendix B.

The questionnaire was also reviewed by the RBS Committee for the Protection of Human Subjects. A copy of the questionnaire used in the survey can be found in Appendix A.

Procedure of the Study

The survey was to be limited to first, third, fifth, and seventh grade teachers within the tri-state area of Delaware, New Jersey, and Pennsylvania. The original target sample size of 3,000 teachers was selected so that even if the return rate was as low as one-third, one thousand returns could still be expected. The total number of questionnaires was first apportioned over the three states according to the total population of each state.[10] However, since Delaware's population is only about one-fortieth the population of the three states combined, extra questionnaires were alloted to Delaware to try to ensure a reasonable number of returns from that state. Each state sample was then stratified in five types of community categories: metropolitan, suburb of a metropolitan area, city, suburb of a city, and rural. A community of 200,000 or more inhabitants was classified metropolitan. Communities with a population between 25,000 and 199,999 were classified as cities. Suburbs of both metropolitan areas and cities were obtained by studying a map to select communities that were adjacent to the metropolitan areas or cities. Communities with less than 25,000 inhabitants that were not adjacent to a city or metropolitan area were classed as rural.[10] Generally, rural communities were selected from counties that within the given state had relatively low populations. The number of questionnaires allotted to each type of community was also based on census data indicating the percent of the state's inhabitants living in communities of each type.

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[10] In all cases, 1970 census figures were used. The size-of-community categories were adapted from those used by the National Assessment of Educational Progress.

The number of questionnaires allotted a type of community within a state was then equally distributed among the four grade levels being sampled.

In Pennsylvania, the two metropolitan communities, Philadelphia and Pittsburgh, as well as thirty-eight of their suburbs were sampled. Thirty-two cities and approximately one suburb of each of the cities were included.[11] Rural communities were selected from the twenty-six counties listed in Appendix B.

In the case of New Jersey, two metropolitan communities, Jersey City and Newark, and fifty cities were identified.[12] Each of the forty-four suburbs of a metropolitan area was located in one of the following counties -- Bergen, Essex, Hudson, or Union. Fifty-eight distinct communities identified as suburbs of cities were sampled. Schools from rural areas were selected from Cape May, Hunterdon, Salem, Sussex, and Warren counties.

Since Delaware's largest city, Wilmington, has a population of less than 200,000, no community in Delaware qualified as metropolitan, and Wilmington was the only community classified as a city. Nine communities surrounding Wilmington were selected to represent suburbs of Wilmington. Rural communities were selected from Kent and Sussex counties as well as from communities in New Castle County that are not adjacent to Wilmington.

Individual schools within the designated communities were randomly selected from the Directory of Delaware Schools, the New Jersey Education Directory, and the Pennsylvania Education Directory.[13] These sources, as well as the Directory of Public Elementary and Secondary Schools in Selected Districts[14] and telephone directories, were used to obtain school names and addresses, names of principals, and grades included within a given school building.

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[11] A list of these cities can be found in Appendix B.

[12] A list of the cities can be found in Appendix B.

[13] The Delaware State Department of Instruction, "Directory of Delaware Schools," (n.p.: The Delaware State Department of Instruction, September, 1975); The New Jersey Department of Instruction, "New Jersey Education Directory," (Trenton: New Jersey Department of Education, 1976); "1976-1977 Pennsylvania Education Directory," (Lebanon, Pennsylvania: Applied Arts Publishers, 1976).

The decision was made to reach teachers through building principals. Each school's packet of materials was addressed to the school principal. A letter to the principal provided background information about the study, requested the school's cooperation and specified the number and grade level of teachers to whom the questionnaires should be distributed. A copy of one such letter may be found in Appendix C.

Attached to each individual questionnaire was a letter to the individual teacher explaining the purpose of the survey, requesting cooperation, and explaining the procedures for the return of the questionnaire. A copy of the letter may be found in Appendix C. Each teacher received an addressed, postage-guaranteed envelope and was asked to return the questionnaire by the end of January, 1977. Each questionnaire was coded with a four digit number assigned to the school. In this way individual teachers remained anonymous, but each questionnaire could be traced to a school.

In all, 3,087 questionnaires were mailed to 804 different schools between January 4 and January 7, 1977. The first three completed questionnaires were received January 7, 1977 and the last six that were completed and included in the study were received on February 15, 1977. (The "winter of '77" caused school closings in the tri-state area during January and

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[14] Directory of Public Elementary and Secondary Schools in Selected Districts (Washington, D. C.: U. S. Department of Health, Education, and Welfare/Office for Civil Rights, 1970).

February prompting us to extend the announced deadline for two weeks.)

One thousand three hundred forty-three questionnaires (43%) were completed and received in time to be included in the study.[15] Responses were fairly evenly distributed across grade levels, states, and types of community. The response rate from seventh-grade teachers, 48.6%, was somewhat higher than the average response rate. State return rates were 53.3% from Delaware, 35.2% from New Jersey and 47.1% from Pennsylvania. Across all states and grades, rural areas and suburbs of metropolitan areas had the highest rates of return, 53.8% and 48.3% respectively. Metropolitan areas had the lowest return rate, 34.2%. Appendix B includes complete data on both the number of questionnaires distributed and on the rate of return.

Approximately two hundred of the questionnaires that were returned in early January were reviewed so that the responses to the open ended items (questions 23, 35, 36) as well as those written after the often listed "other-please specify" direction could be tabulated, classified and coded. In addition partial lists of textbooks and standardized tests were developed. Once these categories and lists were prepared, all incoming questionnaires were reviewed. Each questionnaire was assigned an identification number indicating the state, type of community, school, grade and, where necessary, whether this was the first or second questionnaire received from that school for this particular grade level.[16] The open-ended items and answers listed under "other" were then read and numbers written next to the teacher's response. Responses were later coded on data sheets for key punching.

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[15] Approximately forty questionnaires were received after February 15. These were not included in the data reported here.

[16] Most schools received only one questionnaire per grade level. However in those districts where school populations for a building are limited to K-3, 4-6, or 7-8, schools may have received two questionnaires for a grade level.

After all the questionnaires utilized in this report had been received, coded, and key punched, a stratified sample of twenty-five of the respondents was interviewed. A copy of the interview questions and distribution of the interviewees by state, type of community, and grade level may be found in Appendix D. These interviews gave some indication of the way in which teachers interpreted the questions and the degree to which we interpreted their answers correctly. Additional information on some of the classroom practices was also gathered. Insights derived from the interviews will be mentioned at appropriate places throughout the report. The overwhelming majority of interview responses supported and confirmed the questionnaire responses.

Limitations of the Study

The study is based on practices that teachers reported — as contrasted with practices that were observed. Since the teachers were to some degree selected by building principals, it might be assumed that the respondents represent teachers who are viewed by their principals as more interested in and perhaps more competent in teaching mathematics. In those schools where there is only one classroom per grade level, this bias may not have operated. The two interviewers felt that, in general, the teachers interviewed tended to be more experienced teachers and more interested in the teaching of mathematics than would a completely random sample of teachers. Thus, principal selection and the teachers' self-selection in choosing to answer the questionnaire may result in an optimistic picture of mathematics classroom practices.

Organization of the Report

There are many organizational formats in which the results of the study might be reported. Since the majority of the questionnaire items deal with classroom processes, the responses are reported, as much as is possible, in terms of the four classroom process constructs described in the Cooley-Lohnes model: opportunity, motivators, structure, and instructional events.[17] The percent of teachers reporting an affiliation with a math education association and percent reporting that their districts have math supervisors are reported in a separate section. Teachers' uses of and attitudes toward the hand-held calculator are described in the last section.

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[17] Cooley and Lohnes, op. cit.

II. OPPORTUNITY

As defined by Cooley and Lohnes,[18] opportunity to learn refers both to the amount of time available for learning and the extent to which the content and/or behavior taught matches the content and/or behavior tested. Data on the reported amount of time spent and the utilization of the time are reported below. Although the questionnaire format did not permit investigation of the match between content taught and criterion tests utilized, data are presented on what texts and tests are used and the patterns and frequency of their use.

Time

Both the total amount of time spent in school and the amount of time scheduled for instruction in a specific subject have been related to student achievement. Approximately 80% of all respondents indicated that the number of student attendance days in the current school calendar numbered between 180 and 184. Table 1 shows that there is a great deal of uniformity in the length of the school year. However, for the small number of schools reporting a relatively small or relatively large number of school days, the differences in the length of the year are large enough to be within the range which research has shown influences student achievement.[19]

Our interviews also gave us the chance to ascertain the length (excluding recess and lunch periods) of the school day. For the twenty-five schools visited, the length of the school day ranges from four and one-half hours to six and one-quarter hours. The mean school day was five and one-quarter hours. (Thus, a forty-five minute math class would be approximately 14% of the mean school day.)

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[18] Cooley and Lohnes, op. cit.

[19] A. Harnischfeger and D.E. Wiley, "Schooling cutbacks and achievement declines: Can we afford them?" Administrator's Notebook, 26, Volume No. 1, 1975.

Table 1. Reported Number of Student Attendance Days in School Year

Number of Days	Percent of Respondents			
	Grade			
	1	3	5	7
Less than 180	2.1	1.8	2.4	1.9
180	56.7	51.6	53.0	49.3
181-184	24.3	29.8	29.2	34.1
185-189	10.7	9.4	9.4	11.7
190 or more	1.2	.6	.6	0.0
No response	5.0	6.5	5.3	3.2
Range	159-190	138-197	159-190	159-189

The students' opportunity to learn is influenced not only by the number of days that school is open, but also by the amount of time students actually spend in school. Ninety percent of the first and third grade teachers reported that attendance in math class ranged from 91% to 100%. At the fifth and seventh grade levels 80% of the teachers indicated that attendance was 91% to 100%. However, during the interviews, teachers were again asked to indicate the size of their class, the attendance on the day of the interview, and whether or not this attendance was typical.

At the time of the interview, 28% of the interviewees reported and accepted as typical an attendance rate that was lower than that reported on the original questionnaire.

Approximately 93% of the respondents teaching first, third and seventh grade reported having math class five times per week, An additional 3% of those teachers reportedly have math three or four times per week. At fifth grade level only 88% of the teachers reported having math five times a week with another 7% reporting that they had math four times per week. The reported length of the math classes is shown in Table 2. As might be anticipated, the time spent in math tends to increase from grade one to grade five. The weighted mean lengths for grades one, three, five and seven are 38 minutes, 45 minutes, 47 minutes and 44 minutes respectively.

Table 2. Reported Length of Daily Math Class by Grade Level

Class Length in Minutes	Percent of Respondents			
	Grade			
	1	3	5	7
15-25	6.8	2.5	0.0	0.0
26-35	30.9	9.7	3.8	1.6
36-45	42.2	46.8	46.0	61.6
46-55	7.5	19.7	29.1	31.9
56-65	11.0	16.5	16.9	3.2
Over 65	.9	3.2	2.4	1.1
No Response	.9	1.3	1.3	.5

While the data on class time are quite similar to those reported by the 1975 NCTM study,[20] the present fifth grade sample appears to have slightly more time scheduled for math than did the NCTM sample. In the present study, 95% of the fifth grade teachers spent 40 minutes or more on math while this was true for only 83% of the NCTM fifth grade sample. Although 5% of the fifth grade NCTM sample reported spending less than 30 minutes on math, none of the fifth grade teachers in the present sample reported spending less than 30 minutes on math.[21]

Teachers were also asked to indicate how many minutes of their daily math class time were spent in each of the following activities: introducing new work, practicing new work, reviewing homework, practicing review concepts or drill in basic facts or algorithms, disciplining, and managing non-math related activities. Tables 3-7 show the data for each grade level. In grades three, five, and seven it is interesting to note that approximately 30% of the teachers report that they daily spend 10 minutes or less introducing new work. Also, very little class time reportedly was used for review of concepts and drill in basic facts. Twenty-eight percent of the fifth grade teachers and 48% of the seventh grade teachers reported that they use less than 6 minutes of daily class time for review or drill. The question concerning number of minutes spent on discipline and management had one of the highest no response rates of any question on the survey. The relatively large number of teachers not responding to the item and the number of teachers reporting that they spend no time on discipline or management may indicate that teachers either do not have clear perceptions

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[20] Conference Board of the Mathematical Sciences, op. cit., p. 73.

[21] Ibid.

Table 3. Reported Number of Minutes of Daily Math Time Spent Introducing New Work

Number of Minutes	Percent of Respondents			
	Grade			
	1	3	5	7
0-5	2.1	3.2	0.0	4.8
6-10	38.2	25.6	27.3	28.5
11-15	34.8	31.4	37.6	36.4
16-20	16.0	22.0	22.6	20.1
21-25	3.9	6.5	5.0	5.3
26-30	1.5	4.5	3.1	1.3
Over 30	1.5	.6	1.5	1.1
No response	2.1	5.8	2.8	2.6

Table 4. Reported Number of Minutes of Daily Math Time Spent Practicing New Work

Number of Minutes	Percent of Respondents			
	Grade			
	1	3	5	7
0-5	2.7	1.6	1.6	8.6
6-10	26.4	16.5	17.3	43.3
11-15	33.3	28.2	30.4	27.2
16-20	25.9	31.5	23.2	11.2
21-25	4.5	6.2	8.5	3.0
26-30	4.2	6.5	10.3	2.4
Over-30	.6	2.8	4.1	1.4
No response	2.7	6.5	4.7	3.4

Table 5. Number of Minutes of Daily Math Time Spent Reviewing Homework

Number of Minutes	Percent of Respondents			
	Grade			
	1	3	5	7
0-5	33.9	34.7	18.5	14.8
6-10	10.4	35.6	50.1	55.4
11-15	3.6	7.1	14.7	20.1
16-20	.9	2.9	4.7	3.7
21-25	0.0	.3	.6	.3
26-30	0.0	.3	.3	.5
Over 30	0.0	0.0	.3	.6
No response*	51.3	18.8	10.7	4.7

* Teachers who never assign homework did not respond to this question.

Table 6. Reported Number of Minutes of Daily Math Time Spent Practicing Review Concepts or in Drill on Basic Facts or Algorithms

Number of Minutes	Percent of Respondents			
	Grade			
	1	3	5	7
0-5	16.6	19.2	28.4	48.5
6-10	39.7	36.6	34.5	28.0
11-15	17.5	22.0	11.3	3.1
16-20	13.4	7.4	5.0	1.4
21-25	.3	.6	2.5	1.1
26-30	3.3	1.0	1.9	1.4
Over 30	1.5	1.5	2.5	.3
No response	7.7	11.4	13.8	16.4

Table 7. Reported Number of Minutes of Daily Math Time Spent Disciplining and Managing Non-math Oriented Activities

Number of Minutes	Percent of Respondents			
	Grade			
	1	3	5	7
0	20.2	19.8	24.1	11.9
1-5	25.3	30.2	35.5	62.7
6-10	7.1	8.1	6.6	8.1
11-15	1.5	4.8	2.8	1.4
Over 15	6.0	1.2	2.5	1.8
No response	40.1	35.7	28.5	14.2

of this use of class time or that they are unwilling to share them.

In the interview sessions, we asked teachers how often their math classes were interrupted by assemblies, fire drills, special programs, etc. Practices again were reported as quite varied with some teachers indicating that their classes were never interrupted or that there was an interruption almost daily for at least one student in the room. The most frequent response was that math class was interrupted about four times per month.

A further opportunity for learning may be found in homework assignments. Although 49% of the first grade teachers reported that they never give homework, only 1.3% of the seventh grade teachers made the same claim. Data on the frequency with which homework is assigned are given in Table 8.

Teachers at the first and third grade level who do assign homework report that the average assignment is approximately 20 minutes in length; while fifth and seventh grade teachers indicate that their assignments are usually 25 to 30 minutes long. Eighty percent of the fifth and seventh grade teachers indicated that at least 75% of their students completed assigned work. About 3% of the fifth and seventh grade teachers indicated that less than fifty percent of the students complete homework assignments.

Table 8. Reported Frequency of Math Homework Assignments

Frequency	Percent of Respondents			
	Grade			
	1	3	5	7
Five times per week	5.0	19.4	10.7	17.9
Four times per week	5.0	19.2	41.7	47.2
Three times per week	4.2	9.8	21.3	21.4
Two times per week	5.3	12.7	8.2	5.5
Once a week	6.5	10.4	4.1	1.3
Never	48.9	10.1	4.7	1.3
Only to individuals as needed	15.7	6.8	4.7	1.6
Only work not completed during class	3.0	4.9	3.1	.8
Other	2.7	2.6	.6	.8
No response	4.2	4.2	.9	2.1

During the interviews we asked the nineteen teachers who gave homework whether the homework they gave was typically practice of new concepts and skills or review of work covered sometime ago. Twelve of the teachers said that the homework included entirely or mainly practice of new work. One of these teachers noted that the only time review was included was prior to a test. Five other teachers indicated that the homework they assigned included both new and review work.

Criterion Relevant Instruction

In the Cooley-Lohnes Model, the "Criterion Relevant Instruction" variable refers to the extent to which students are taught the concepts on which they are tested, i.e., the match between tested performance or knowledge (the criterion) and what is actually taught (the instruction). If what is tested has not been taught, students will not have an in-school opportunity to learn that concept or skill.

In order to assess this variable, it is necessary to have information on what materials are used in the classroom for both teaching and testing. Several questions on the math survey requested information related to this variable. Among these were inquiries about commercial texts and tests used, what supplementary materials are used, and the extent to which commercial versus non-commercial instructional materials are used.

In most classrooms surveyed at all grade levels, one basic math text was used by most or all students as opposed to the regular use of two or more texts. This was true for about 80% of the first grades and about 65% of the classes in grades three, five, and seven. As can be seen in Table 9, the tendency to use supplementary texts seemed to increase from grades one to five. Only 3% to 8% of the teachers at each grade level reported using no textbook or using it only for their own information while students used workbooks or other materials.

Table 9. Use of Textbooks

Text Usage	Percent of Respondents			
	Grade			
	1	3	5	7
One basic text is used by most or all students.	81.3	67.2	63.3	65.2
One text is used predominately, but several are available and used occasionally by many students.	9.5	17.5	19.4	21.6
Two or more texts are used fairly evenly.	3.9	4.2	8.8	5.0
No basic text is used by the students.	3.3	7.8	6.0	4.7
Other	.6	.6	.6	.8
No response	1.5	.6	.9	1.6

These results can be compared with those from the 1975 NCTM study. That study of second and fifth grade math teachers found only 56% using a single text and another 26% using one text predominantly among two or more.[22] The present Delaware-New Jersey-Pennsylvania study shows more teachers using a single text, and slightly fewer using one text along with others. In both studies, the proportion of teachers using a predominant or a single text is between 77% and 90%.[23] Like the present study, the NCTM survey also found more teachers at the lower grade levels using a single text and only about 7% using no basic text.[24]

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[22] Conference Board of the Mathematical Sciences, op. cit., p. 72.

[23] Ibid.

After all of the texts that were reported in use by the 1,343 respondents had been tallied by publisher and title, 61 different texts, or text series, published by one of 25 different publishers were identified. Table 10 presents some of the statistics concerning the most frequently used textbooks. A complete set of data on the use of all identified textbooks may be found in Appendix E.

In all grades, 40% to 50% of the classes surveyed were using one of the five most popular texts for that grade. The ten most frequently used texts account for about 90% of the classes in first grade and for about 67% of the third, fifth and seventh grade classes. At least 50% of the classes at all grade levels were using a text published in 1972 or later. Thirteen to 25% were using a book published between 1967 and 1971. Although most classes were using fairly recent texts, one teacher reported using a text copyrighted in 1954! The results concerning the age of the texts being used are similar to the results of the NCTM study. In that study, 65% of the texts in use had a copyright date within five years of the survey date and 19% had a copyright date within 6 to 10 years of the survey date.[25]

During the interviews teachers were asked several questions about their use of the textbook. Most of those responses are reported in the section on Instructional Events.[26] It was found that in 8 of the 25 schools in which interviews were conducted not all grades in the building used the same

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[24] Ibid.

[25] Ibid.

[26] See pages 51 and 52 of this report.

Table 10. Characteristics of Textbooks Reported in Use

Characteristic	Grade			
	1	3	5	7
Number of publishers with texts reported in use	13	15	18	17
Publisher whose texts are most widely used	Addison Wesley	Addison Wesley	Addison Wesley	Houghton Mifflin
Most frequently used text (% of respondents using text)	Investigating School Mathematics (17.5%)	Elementary School Mathematics (14.2%)	(10.3%)	Modern School Math: Structure and Use 7 (16.9%)
Second most popular text (% of respondents using text)	Holt School Math (11.9%)	Mathematics Around Us (8.8%)	Modern School Mathematics: Structure and Use (10.0%)	Holt School Math (7.7%)
Percent of texts in use published 1976-1972	78.0%	58.8%	60.1%	62.1%
Percent of texts in use published 1971-1967	13.1%	26.2%	26.2%	25.5%
Percent of texts in use published prior to 1967	0.0%	.6%	.3%	1.1%
Percent of respondents not indicating publication date or text	9.2%	14.6%	13.2%	10.6%

text. Sixteen of the interviewees reported that the same text was used throughout the building, in the building with the exception of kindergarten, or in the building with the exception of grades seven and eight. One teacher was not certain of the text being used in other classes.

Interviewed teachers rated their textbooks in terms of the extent to which teachers felt that texts matched their students' interests. As might be expected, the ratings varied, even for the same textbook. Generally, the interviewed teachers rated the texts slightly above 3 on a scale where 1 indicated a low match and 5 a close match.

The questionnaire asked teachers to respond to the question "Do you regularly (at least once a week) use a supplementary workbook or drill and practice program?" Fifty-seven percent of the first grade teachers, 45% of the third and fifth grade teachers, and 53% of the seventh grade teachers reported that they did not regularly use a supplementary drill and practice program. During the follow-up interviews, we found that one-fourth of the sample that on the questionnaire indicated regular use of a drill and practice programs, in fact, did so quite irregularly. This finding seems consistent with the fact that teachers generally reported not spending much time on drill and practice.[27] The results of the survey would not indicate that vast amounts of time are spent on drill and practice. Indeed, given the results of the survey, one might argue that too little time is spent on systematic review and drill.

At all grade levels, 50% to 80% of those using a drill and practice program used workbooks, usually those that accompanied the students' textbook.

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[27] See page 15.

Commercial dittos were used by about 25% of those using a drill and practice program. Less than 4% of these teachers used drill and practice kits and less than 1% used puzzle-type workbooks. Only one teacher in the entire sample indicated the use of a "Digitor," "Quiz Kid," or "Mathiputer" (preprogrammed calculator that poses basic fact problems and supplies feedback on child's response) in a regular drill program.

One interesting aspect of the use of commercial materials in the classroom is the fact that in first, third, and fifth grade, about two-thirds of the teachers had little or no involvement in selecting the basic text they use. Only 5% of the teachers at these grade levels indicated that they were solely responsible for the text selection. At seventh grade, teachers were somewhat more involved with almost half reporting considerable involvement and 10% reporting sole responsibility in selecting the basic text. However, in selecting supplementary materials, 80% to 90% of the teachers at all grade levels had at least some involvement. At least half had considerable involvement or were the sole selector of such materials for their classes. Teachers may be less committed to the use of texts they have not helped select and thus depend more on supplementary and self-made materials.

In addition to commercial materials, teachers also utilize teacher-made materials and materials developed by the school or school district. Teachers' responses concerning the extent of use of commercial materials are summarized in Table 11. While 96% of the teachers report using a basic textbook, 14% (first grade) to 30% (seventh grade) report using commercial materials less than 20% of the time. At all grade levels, only about one-third of the teachers used commercial materials more than 60% of the time, while 30% to 40% of the teachers used commercial materials less than 40% of the time. The largest group of teachers at each level used commercial materials between 40% and 80% of the time, with teachers in first grade utilizing the commercial materials a larger portion of the time than teachers at higher grade levels. To summarize, it seems that students spend, on the average, a little more than half of their time on commercial materials.

Table 11. Reported Amount of Class Time Spent with Commercial Materials

Percent of Class Time	Percent of Respondents			
	Grade			
	1	3	5	7
0% - 20%	14.3	23.3	22.7	29.6
21% - 40%	13.7	16.1	15.2	13.5
41% - 60%	28.2	20.8	18.2	19.5
61% - 80%	30.2	23.3	22.8	20.1
81% - 100%	7.2	6.8	11.6	10.9
No response	6.5	9.1	8.5	6.6

What kind of materials are used during the rest of the time? About half the teachers reported using some locally (district or school) developed materials, but generally, as shown in Table 12, these were used less than 20% of the time. The rest of the students' time seemed to be spent on teacher-made materials. As can be seen from Table 13, nearly all teachers reported using teacher-made materials. Nearly half of the teachers used teacher-made materials between 20% and 60% of the time. Approximately 30%

of the teachers reported using their own materials less than 20% of the time, but less than 20% of the teachers used them more than 60% of the time. Generally, students seem to be using teacher-made materials less than 40% of the time.

Table 12. Reported Amount of Class Time Spent with Locally Developed Materials

Percent of Class Time	Percent of Respondents			
	Grade			
	1	3	5	7
0% - 20%	26.8	30.1	37.0	46.3
21% - 40%	6.6	6.6	7.2	4.0
41% - 60%	1.5	3.2	3.1	.8
61% - 80%	.6	1.6	1.5	1.3
81% - 100%	0.0	.9	.6	0.0
No response	64.7	57.1	50.5	47.8

Table 13. Reported Amount of Class Time Spent with Teacher-Made Materials

Percent of Class Time	Percent of Respondents			
	Grade			
	1	3	5	7
0% - 20%	24.7	29.2	32.3	30.7
21% - 40%	34.7	27.2	29.9	26.7
41% - 60%	24.4	19.7	17.5	18.0
61% - 80%	9.9	13.6	8.5	11.6
81% - 100%	1.8	4.4	6.2	9.5
No response	4.7	5.5	4.1	3.2

Teachers were asked to indicate whether or not a standardized math achievement test had been given to the students in their class last year. Thirty-five percent of the first grade teachers and approximately 50% of the third, fifth and seventh grade teachers reported that students had been tested. Thirteen different achievement tests were reported in use. The most widely used achievement tests were used by 10% to 13% of the classes at a particular grade level. (A list of the tests reported in use and a table showing the extent of the use may be found in Appendix E.)

Without actual classroom observations and more information from teachers, little can be said about the degree to which the standardized achievement tests include material that is covered in the classroom. The response to questions on the use of class time for drill and practice and the use of supplementary materials for drill and practice would not lead one to conclude that large portions of the math time are spent in drill activities. It would appear that teachers do spend a considerable amount of class time on material other than that found in the commercial materials that are available to them. It is possible that neither standardized test results nor an analysis of the material that exists in texts reflects what is being taught in the math classroom.

III. MOTIVATORS

In the Cooley-Lohnes Model, motivators refer to those aspects of both the personal interactions in the classroom and the materials that might encourage student interest and learning.

Curriculum Motivators

Curriculum motivators refer to aspects of the curriculum which encourage student learning. Curriculum materials that are interesting and varied would be expected to interest students as would prompt and frequent feedback on students' performance. The use of concrete materials is of particular interest to mathematics educators for whom so much of the "new math" era has included an emphasis on the increased use of manipulatives.

Several questions on the survey dealt with the use of a variety of instructional devices: films, television, lab experiences, calculators, computers, games and puzzles, metric measuring equipment, and general manipulatives (rods, counters, balances, etc.). Not surprisingly, general manipulatives and games and puzzles were the most widely used materials. They were used most frequently in first grade with usage declining in grades three, five, and seven. Table 14 indicates that 58% of the first grade teachers reported using manipulatives almost daily as did 23% of the third grade teachers. The general pattern of use of manipulatives follows that reported in the NCTM study. However, teachers in the present study apparently reported a slightly higher use of manipulatives. The NCTM study indicates that "21 percent of the second-grade specialized teachers indicate their [manipulatives] use nearly every lesson."[28] The third grade teachers responding to the present survey included less than 1% math specialized teachers, yet 23% report using manipulatives in nearly every lesson.

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[28] Conference Board of the Mathematical Sciences, op. cit., p. 74.

Table 14. Reported Use of Manipulative Materials

Frequency of Use	Percent of Respondents			
	Grade			
	1	3	5	7
Never	3.6	10.7	19.7	37.2
Less than once a month	3.6	13.3	27.6	34.3
At least once a month	9.2	24.0	27.3	13.2
At least once a week	21.4	23.7	13.8	6.3
Almost daily	58.5	22.7	5.3	2.4
No response	3.9	5.5	6.3	6.3

Games and puzzles were also used frequently in first and third grade with use again declining in fifth and seventh grade. However, as can be seen by comparing Tables 14 and 15, games and puzzles were reportedly used more frequently in fifth and seventh grade than were general manipulatives.

Table 15. Reported Use of Games and Puzzles

Frequency of Use	Percent of Respondents			
	Grade			
	1	3	5	7
Never	.3	.6	.6	1.6
Less than once a month	3.6	5.5	15.0	23.5
At least once a month	12.5	20.5	31.3	42.0
At least once a week	31.2	42.2	37.6	27.4
Almost daily	49.6	28.6	13.8	2.6
No response	3.0	2.6	1.6	2.9

The move toward the metric system is underway and mathematics educators may well be interested in the extent to which metric equipment is being utilized in the schools. Results of the survey indicate that unlike general manipulatives, the use of metric measuring materials increases from grade one to grade three to grade five. However, even at the fifth grade level 18% of the teachers indicated that they never use metric measuring devices and an additional 31% indicated that they use such equipment less than once a month. Table 16 would indicate that there is a great deal of room for increased utilization of metric measuring materials at all of the grade levels surveyed. Although most recent texts include materials on metric measurement, the need for providing students with the actual experience of measuring is widely acknowledged.[29] Classrooms do not appear to be "inching" toward metric; they may be millimetering their way there.

Table 16. Reported Use of Metric Measuring Equipment

Frequency of Use	Percent of Respondents			
	Grade			
	1	3	5	7
Never	26.4	27.3	18.5	17.7
Less than once a month	30.0	26.0	30.7	35.6
At least once a month	19.9	22.4	22.3	26.6
At least once a week	10.1	11.4	15.4	12.4
Almost daily	2.1	4.2	4.7	2.4
No response	11.6	8.8	8.5	5.3

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[29] George W. Bright, "Metrics, Students, and You!," Instructor, (October, 1973), pp. 60-66; NCTM Metric Implementation Committee, "Metric Competency Goals," Arithmetic Teacher, XXIII (January, 1976), pp. 70-71; and Richard J. Shumway and Larry Sachs, "Don't Just Think Metric--Live Metric," Arithmetic Teacher, XXII (February, 1975), pp. 103-110.

Hand-held calculators are obviously a part of today's environment and have frequently been suggested as potentially motivating for the math classroom. Are they being used? Only 4% of the teachers at grade one and 25% of the grade seven teachers reported that they had used hand-held calculators in their classrooms. Approximately 80% of the first, third and fifth grade teachers and 67% of seventh grade teachers reported never having used the calculator in class. In an area which is apparently developing rapidly, it seems amazing that these figures are so close to the ones cited in the 1975 NCTM study. Price reports that 78% of the teachers surveyed at that time reported never having used a calculator in the classroom.[30]

Calculators seem to be used most frequently for checking work or for motivational purposes. The few first and third grade teachers who used calculators also used them for drill, while fifth and seventh grade teachers used them more for word problems or with instructional materials specifically designed for the calculator. The section of this report beginning on page 57 contains more information on teacher reported uses of the calculator and their attitudes toward its use.

At all grade levels surveyed, about 90% of the teachers reported that in math they rarely or never use television, computer-assisted instruction, calculators, or computer terminals. Forty percent of the teachers reported never using films, and another 40% indicated that they use films less than once a month. The NCTM survey results for the use of television and computers were rather similar, although they indicated somewhat more frequent use of these media. The NCTM report indicates that 78% of the respondents never used television and that 81% never used computer-assisted instruction.[31]

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[30] Conference Board of the Mathematical Sciences, op. cit., p. 75.

The twenty-five follow-up interviews provided some additional insights into teacher use of various curriculum materials. We asked teachers to indicate the topics they had taught in the last two weeks and the manipulatives, games, puzzles and/or films that they had used in conjunction with these topics. The most frequently named "manipulatives" were flashcards and worksheets. One teacher indicated that she had used the blackboard and the classroom clock for her work on time. In 24% of the interviews the number of manipulatives and number of puzzles or games the teachers had utilized during the past two weeks were substantially less than the number reported on the questionnaire. Although it is likely that any specific two weeks are not typical of the year, it should be noted that in only one case did an interviewee apparently use more manipulatives in the two weeks prior to the interview than the questionnaire response indicated. In summary, our interviews led us to conclude that teachers were apt to classify as manipulatives many objects which math educators would not classify as such. Therefore, the data presented in Tables 14-16 are probably overstatements of the use of the various modes of instruction. It should, however, be pointed out that we did see a number of elementary classrooms that were rich in both commercial and teacher-made math manipulatives and games.

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[31] Ibid.

When manipulatives are used, teachers reported they most often had the material available to the student for use as the student needed it. Teacher-directed activities constituted the next most frequent use of manipulatives. Student free exploration and teacher demonstrations were less frequently used.

Teachers listed factors they felt were important in selecting manipulatives for a specific lesson. Appropriateness for the lesson objectives and ease of use were most important for teachers at all grade levels. Other factors mentioned included attractiveness, availability, and durability.

Teachers also listed factors they felt were important to consider in selecting a game or puzzle for use by students. Again the most important factor listed by teachers at all levels was appropriateness (how well the game helps to achieve the lesson's objectives). Ease of use and attractiveness were listed as next most important. Other factors mentioned included availability, durability and, at the lower grade levels, whether or not students could use the game or puzzle on their own.

Most teachers (50% - 66%) at all levels said that enrichment activities for more advanced students usually involved work on the same topic but in a different context or format or at the next level of difficulty. As grade level increased, teachers' tendency to give work on a topic which most students would not reach during the school year also increased from 20% to 40%. Generally less than 20% of the teachers reported utilizing self-selected topics for enrichment.

In addition to the variety and attractiveness of curriculum materials, prompt and frequent feedback to students can be motivating. Questionnaire item #15 was designed to provide information on the frequency with which teachers collected, reviewed, and returned assignments to students with feedback. Most first grade teachers who assign homework or seatwork said that they check and return every assignment. While 57% of the third and fifth grade teachers reported returning papers with feedback for every assignment, only 35% of the seventh grade teachers made the same claim. Approximately 4% of the third, fifth, and seventh grade teachers reported checking and returning homework less than once per week. The practice of students checking their own homework during class increased with grade level. Almost 30% of the seventh grade teachers did not respond to the frequency with which they checked work, but reported that their students checked their own or other students' papers during class. While this method may provide students with feedback, teachers may be losing feedback.

In all cases, the information concerning the return of homework that teachers gave during the interview agreed with the information they had supplied on the questionnaire.

Interpersonal Motivators

Several aspects of teachers' relationships with students also support and encourage student learning. Besides explicit instruction, interpersonal motivators may include verbal and non-verbal reinforcement, awareness and sensitivity to student needs and interests, and the extent to which the teacher encourages such things as student self-management and peer tutoring. Obviously such information is difficult to obtain from a questionnaire.

The only related item on the questionnaire was one which gave teachers the opportunity to describe ways they try to assist students having trouble with math concepts. "If a student has been working for several days on a difficult concept or skill in mathematics and seems to be making no progress toward mastery, what do you do?" The most frequently listed approach was giving individual help (reported by 41% of the first grade teachers and increasing to 58% among seventh grade teachers). Trying a new method was also listed frequently; this perhaps occurring in the process of giving individual help. Thirty percent of first grade teachers said they have the student move on and return to the difficult topic later, but this approach decreased to 14% in seventh grade. Other techniques mentioned included remedial group assignment, going back to a previous concept (again perhaps a part of the individual help), or assigning peer tutors. On the average, only about 15% of the teachers reported using peer tutors in response to the situation posed, though about 30% did report use of peer tutoring to help students who failed a mastery test.

IV. STRUCTURE AND PLACEMENT

The structure of a program and how students are placed in and moved through the curriculum represent a third major construct in the Cooley-Lohnes Model of classroom practices.[32] Information on the use of instructional objectives and teacher reported grouping, matching, and sequencing and pacing procedures is discussed below.

Instructional Objectives

The instructional objectives used for teaching and testing influence student performance. The specificity and clarity of the goals or objectives and the degree to which the curriculum materials match these goals are variables to which the Cooley-Lohnes Model attends.[33]

As was pointed out in the 1975 NCTM study, the development and use of instructional objectives have been topics of interest to educators in many content areas, including mathematics.[34] In some states and large districts, objectives for math instruction are published and are the source of items for state or district assessment tests. Thus, it was felt that the source of the objectives that teachers used and the ways in which teachers used them were of interest both in terms of the Cooley-Lohnes Model and in view of math educators' current interests.

The questionnaire asked teachers to indicate if and how they used math objectives provided by their state, district, school, and basal text series. Both the questionnaire and interview results indicate that teachers generally are less aware of and make less use of sources of objectives beyond those found in the basal text. Comments on the questionnaires indicated that relatively few schools have their own mathematics objectives. A school's math objectives are usually the same as the district's objectives or the objectives of the basal text series.

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[32] Cooley and Lohnes, op. cit., p. 192.

[33] Ibid.

[34] Conference Board of the Mathematical Sciences, op. cit., p. 71.

Table 17 would seem to indicate that, at this point in time, state objectives go largely unused. However, when the data are examined by state, differences in practice appear. Sixty-seven percent of the teachers in Delaware, 57% of the teachers in New Jersey, but only 35% of the teachers in Pennsylvania reported using state objectives. One might speculate that the use of state objectives is related to the degree to which those objectives are tied to an assessment program and the degree to which the assessment program reports individual student test results. For example, Delaware, the state with the highest reported use of state objectives, has adopted and tests mathematics objectives for grades one, four, and eight. Test data for individual pupils are provided. No first grade teachers from Delaware indicated that state objectives do not exist; however, 6% of the third grade teachers indicated that to the best of their knowledge state objectives do not exist. The New Jersey Educational Assessment Program involves testing pupils at grades four, seven, and eleven. Test results for individual students are returned. The Pennsylvania Educational Quality Assessment program includes a test of basic math skills for students at grades five, eight, and eleven. However, specific objectives have not been listed, tests are not administered annually, feedback is in terms of school means, and item data are provided only on request.

Table 17. Respondents' Awareness and Use of State Math Objectives

Utilization of Objectives	Percent of Respondents			
	Grade			
	1	3	5	7
Do not, to my knowledge, exist	27.6	30.2	24.5	38.0
Exist, but I do not use	24.9	28.6	29.5	24.3
I use to plan lessons	16.4	9.7	15.3	14.8
I use to write skill tests	5.1	2.2	5.0	5.8
I use to write chapter or semester tests	2.4	1.9	3.1	5.0
Other use	.6	.6	.3	1.9
No response	29.1	29.5	26.6	19.0

Tables 18-20 present the responses concerning teachers' use of district, school and basal text objectives. Over 70% of the first, third, and fifth grade teachers, but only 58% of the seventh grade teachers, indicate that they use basal text objectives to plan lessons. About half of the respondents use local and district objectives in lesson planning. Objectives from all sources are reportedly used only half as frequently for test construction as for lesson planning. Teachers' notes concerning other uses of these objectives frequently included the following: to select supplementary materials; to plan learning center activities; to assist the textbook selection process; and to guide general planning for the year.

Approximately 7% of first and third grade teachers, and 11% of fifth and seventh grade teachers reported using sources of objectives other than the text, school, district or state objectives. Those sources teachers listed most frequently included the following: my own, based on many years of experience; a text other than the basal presently being used; and objectives from a teacher's college course.

Table 18. Respondents' Awareness and Use of School District Math Objectives

Utilization of Objectives	Percent of Respondents			
	Grade			
	1	3	5	7
Do not, to my knowledge, exist	9.2	10.1	9.7	17.7
Exist, but I do not use	14.0	11.0	11.3	11.3
I use to plan lessons	54.7	54.0	57.7	52.4
I use to write skill tests	27.0	22.4	25.8	20.9
I use to write chapter or semester tests	12.0	13.3	19.2	20.6
I use district level planning guides and accompanying tests	0.0	2.6	.6	0.0
Other use	.3	2.2	.9	1.6
No response	14.0	17.5	12.9	9.8

Table 19. Respondents' Awareness and Use of
Local School Math Objectives

Utilization of Objectives	Percent of Respondents			
	Grade			
	1	3	5	7
Do not, to my knowledge, exist	21.7	21.8	23.5	19.0
Exist, but I do not use	7.1	3.6	4.4	7.4
I use to plan lessons	42.4	47.7	45.1	58.0
I use to write skill tests	16.3	21.7	20.3	27.9
I use to write chapter or semester tests	9.8	13.3	14.7	23.5
Other use	0.0	2.2	.3	.5
No response	25.8	22.1	21.9	11.6

Table 20. Respondents' Awareness and Use of
Basal Text Math Objectives

Utilization of Objectives	Percent of Respondents			
	Grade			
	1	3	5	7
Do not, to my knowledge, exist	0.0	1.0	1.6	6.4
Exist, but I do not use	3.3	4.9	6.9	14.0
I use to plan lessons	87.9	76.7	72.1	58.0
I use to write skill tests	37.7	46.4	47.9	37.9
I use to write chapter or semester tests	27.0	38.0	42.3	36.3
Other use	.3	1.0	.6	1.3
No response	6.8	9.1	6.9	12.1

Interviewees familiar with district objectives indicated that the statements were frequently general goals rather than specific instructional objectives. However, a sizable portion of the interviewees were uncertain of the specificity of the district goals and left the interviewer with the impression that they had not reviewed these goals for some time. Although it is difficult to determine the reasons for the large number of teachers who did not respond to the questions regarding the use of state and school objectives, interviews would suggest that teachers are uncertain about the existence of state objectives, and that as had been mentioned previously, schools frequently do not have separate objectives. Two of the twenty-five interviewees felt that the questions on uses and sources of objectives were difficult because of the format (chart) in which they were presented.

Students' awareness of instructional objectives, just as the teachers' awareness, may be an influence on student achievement.[35] Although the questionnaire did not address this issue, we did ask the teachers who were interviewed whether or not the student's copy of the textbook conveyed the objectives of the lessons to the students. About one-third of the interviewed teachers reported that the students' textbook made some attempt to convey objectives to the student. The remaining teachers indicated that it was up to them to point out the goals or objectives of the lessons.

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[35] William W. Cooley and Gaea Leinhardt, Design for the Individualized Instruction Study: A Study of the Effectiveness of Individualized Instruction in the Teaching of Reading and Mathematics in Compensatory Education Programs, Final Report (Pittsburgh, PA: Learning Research and Development Center University of Pittsburgh, 1975), p. B-3.

Grouping

Considerations such as the way in which students are grouped for instruction, the size of these groups, and the frequency with which the groups are reformed are also considered under the structure and placement construct of the Cooley-Lohnes Model.

The type of "group" most frequently encountered by the first, third, and fifth grade teachers surveyed was the self-contained classroom. Ninety percent of the first grade teachers, 86% of the third grade teachers, and 54% of the fifth grade teachers reported that they taught math in a self-contained classroom setting. Team teaching situations increased with grade level from only 6% in the first grade to 35% in the fifth grade. Teachers' notes and comments from the interviews indicated that two forms of "teaming" predominated. In some instances, one teacher would teach math and perhaps one or two other subjects to more than two intact homeroom groups. In the second form of "teaming" two or three heterogeneous classrooms at the same grade level regrouped on the basis of math ability to form more homogeneous classes for math. At the fifth grade level 8% of the respondents reported that they were math specialists (i.e., they taught only mathematics). At the seventh grade level, 70% of the teachers reported that they taught only math, 7% indicated they were doing some form of team teaching, and 20% indicated that they were self-contained classroom teachers. During the interviews, some seventh grade teachers who on the questionnaire said they were self-contained classroom teachers stated that they in fact taught only math. Although the concept of "self-contained classroom" seemed to communicate very well with elementary school teachers, the term was apparently misunderstood by some seventh grade teachers. Thus, the percent of seventh grade teachers reporting to be self-contained classroom teachers may be somewhat less than 20%.

The majority of classes at all grade levels included 20-30 students. Table 21 indicates that first grade classes tended to be somewhat smaller than the average and seventh grade classes somewhat larger.

Table 21. Reported Class Size

Number of Students	Percent of Respondents			
	Grade			
	1	3	5	7
15 or less	4.8	5.3	3.3	.6
16-20	18.2	12.7	10.0	8.0
21-25	37.6	39.0	28.6	22.6
26-30	31.1	28.8	39.8	39.6
31-35	7.5	11.7	12.7	25.9
36 or more	.9	.6	3.1	2.7
No response	.3	1.6	2.2	.8
Range	3-37	7-37	3-42	10-57

The basis on which students are grouped within a class changes over the four grade levels. As can be seen from Table 22, while 74% of the first grade classes are grouped heterogeneously, only 38% of the seventh grade classes are grouped heterogeneously. Homogeneous grouping within a grade level increases from grade one to grade seven.[36] Fewer than 7% of the teachers at any grade level reported having any form of mixed age grouping.

Table 22. Type of Classroom Ability

Class Grouping Pattern	Percent of Respondents			
	Grade			
	1	3	5	7
Heterogeneous within a single grade	74.5	62.3	49.8	38.5
Heterogeneous across two or more grades levels	.3	.0	.9	.0
Homogeneous within a single grade	20.5	27.3	40.4	53.8
Homogeneous across two or more grade levels	.9	6.5	6.0	4.0
Social/Behavior considerations	.3	.0	.0	.3
Other	.3	.6	.9	.8
No Response	3.3	3.2	1.9	1.6

At all grade levels surveyed, whole class instruction was the most common form of classroom organization. Sixty percent of first and third grade teachers, 33% of fifth grade teachers, and 70% of seventh grade teachers reported using whole class instruction over 50% of the time.

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[36] The interviews indicated that some teachers confused the terms "heterogeneous" and "homogeneous." Thus, these statistics may be somewhat inaccurate.

In the NCTM study, 43% of the second and 39% of the fifth grade teachers reported using whole class instruction most of the time.[37] Nearly all teachers surveyed in the present study reported using small group and individualized instruction at least occasionally but only a small percent reported using either of these more than 50% of the time. Approximately 13% of first, third, and fifth grade teachers reported using small group instruction the majority of the time. Ten percent of the first and third grade teachers and 16% of the fifth grade teachers reported using individualized instruction a majority of the time. At the seventh grade level, only 4% of the teachers indicated that they used small group instruction predominately and only 7% used individualized instruction predominately.

The small percent of teachers who utilized small group or individualized instruction for a majority of the time was asked to answer some additional questions concerning the basis on which groups were formed and how often they are reformed. Table 23 shows the percent of teachers using individualized or small group instruction as their predominant mode who reported using various sources of data for determining groups or placing individuals. The most commonly used source of data at all grade levels is informal teacher assessment. The second most commonly used form of data is a teacher or school-made diagnostic test. Above the first grade level there was somewhat more use of standardized achievement test data.

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[37] Conference Board of the Mathematical Sciences, op. cit., p. 74.

Table 23. Basis on Which Teachers Using Individualized or Small Group Instruction Form Groups or Place Individuals

Data Utilized[1]	Percent of Respondents Reporting Use of Individualized or Small Group Instruction			
	Grade			
	1 n = 117	3 n = 113	5 n = 144	7 n = 105
Standardized achievement test results	16.2	30.9	38.2	36.2
School district's diagnostic test results	17.9	21.2	16.7	10.5
Commercially-developed diagnostic test results	17.9	25.6	21.5	14.3
Informal teacher assessment	67.5	65.4	56.9	40.9
Teacher or school-made diagnostic test results	48.7	48.6	45.1	40.9
Previous teacher's recommendation	21.4	33.6	26.4	13.3
Student self-selection	4.3	7.9	6.9	15.2
Information on students' permanent records	15.4	13.2	18.0	11.4
State assessment test results	5.1	18.6	10.4	17.1
Affective test results	1.7	2.7	2.8	5.7
Other	0.0	7.9	11.1	9.5

[1] Teachers could indicate more than one source of data.

The teachers reporting use of small group instruction were also asked on what basis they regrouped students. As can be seen from Table 24, informal teacher assessment was the basis on which regrouping was most often carried out. Teacher-made tests were used somewhat less frequently and commercial diagnostic tests and school-made tests were less popular.

Table 24. Basis on Which Teachers Using Small Group Instruction Regroup

Data Utilized[1]	Percent of Respondents Reporting Use of Individualized or Small Group Instruction			
	Grade			
	1 n = 117	3 n = 113	5 n = 144	7 n = 105
Commercially-developed diagnostic or mastery test results	23.0	12.4	15.3	16.2
School district-made test results	9.4	11.5	6.9	3.8
School or teacher-made test results	46.1	49.6	43.7	35.2
Informal teacher assessment	68.3	55.7	47.2	40.9
I never use groups*	.8	2.7	6.3	5.7
Other	1.7	2.7	4.2	7.6

[1] Teachers could indicate more than one source of data.

* Teachers using individualized instruction may have responded in this category.

In first and third grade the largest group of teachers said they reformed groups whenever necessary as students mastered topics. This was true for 60% in grade one and 44% in grade two. In grade one, 14% said groups were reformed only once a year while this was the response of 30% of the third grade teachers. The responses of the remaining 25% of the teachers were distributed among the other options ranging from once a semester to once a week. In fifth grade nearly half the teachers regrouped once a month and another 20% once a year. In seventh grade most regrouping occurred only once a year or once a semester with regrouping "when necessary" third in popularity as a response.

Matching

Matching concerns both how students are placed in a curriculum and how well the curriculum materials meet individual student needs and abilities. The survey results presented below indicate how teachers report that they match curriculum and students, what mastery criteria teachers report using, and the frequency with which testing occurs. These processes are closely related to many of the grouping procedures described in the previous section.

Teachers using predominately whole class instruction were asked on what basis they select their first unit for the year. At all grade levels, most teachers said that they in some way use informal teacher judgment. In some instances teacher judgment is certainly used to supplement more formal testing criteria. Although the survey results would indicate that 25% to 40% rely on teacher-made group diagnostic tests and student permanent record cards, interview results indicated that such sources were used mainly in cases of "problem" students. Despite the availability of a variety of diagnostic tools and the rather widespread use of achievement testing,[38] more than 20% of the first and seventh grade teachers and 12% to 17% of third and fifth grade teachers indicated that they simply start with the first chapter in the textbook. During the interviews 15 of the 25 teachers indicated that they followed the sequence of the chapters in the text throughout the course of the year. The remaining interviewees indicated that they followed a sequence of units which they or their school district had developed.

As was noted in the previous section, teachers utilizing small group or individualized instruction tended to rely more on test results than did teachers using whole-class instruction. In small group or individualized classes, 40% to 50% of the teachers reported using teacher-made or school diagnostic tests. In all three types of classrooms, commercial tests and state assessment tests were, as might be expected, used more above the first grade level. Teachers in small groups or individualized classes relied less on permanent record cards, but about 20% did report utilizing the previous teacher's recommendations.

Other questions on the survey investigated the criteria teachers use for determining mastery and techniques they use with students who are not progressing satisfactorily. Results from these questions were tabulated for all teachers together and were not broken down according to instructional techniques used. Most teachers indicated they expect a majority of their students or all but 1 or 2 in the class to have mastered a topic before they move on to another. Their basis for determining mastery most often was a teacher-made test supported by teacher judgment of written class work and oral response.

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[38] See page 26.

When students have difficulty with a concept, most teachers reported giving individual help, trying a new method, or moving on to return to the difficult topic later. When students fail to pass a test, teachers again reported giving individual help, though in this case they also sometimes used peer tutoring. Other frequently used remedies for non-mastery were repeating the unit, giving special work (perhaps with a new approach or method), and giving extra homework. Some less-frequently-used (10% or less of the teachers) remedies for students having difficulty included: going back to a previous topic; assigning the student to a remedial group; or enlisting the help of aides or parents. Moving on without giving some sort of special help was reported by a small minority of teachers but the tendency increased from 1.5% in first grade to 5% in seventh grade.

The predominant use of informal teacher assessment, teacher-made tests and teacher-tutoring may indicate that in many classrooms there are deficiencies in the match between curriculum materials and student needs and abilities. The teachers who were interviewed were asked to rank their text in terms of how well it matched their students' needs and abilities. On a scale where "1" represented a poor match and "5" a good match, the mean rating was 3.3 However, these same teachers indicated that they needed to create or adapt materials to fill gaps or improve sequencing several times a week. Even those teachers who, using the same scale, rated their texts as "4" or "5", reported creating or adapting materials several times per week.

Perhaps, lacking time and/or experience in measurement, teachers often shortcut the evaluation of student abilities as indicated by the extremely widespread use of "informal teacher judgment" for placement. However, the testing of student progress seems to occur fairly regularly, especially after first grade. In grades three and five, more than 60% reported testing at least every other week, while more than 80% in seventh grade tested this often. In first grade only 45% reported testing every other week or more often, but most tested at least once a month. Most of this testing, if consistent with placement procedures used, is probably done by teacher-made tests. It is interesting to note that most teachers reported having considerable or sole involvement in the decision of how to evaluate their students' math abilities.

Teachers also have an opportunity to match student needs when assigning homework. However, two-thirds of the interviewed teachers who gave homework reported giving every member of the class the same assignment.

V. INSTRUCTIONAL EVENTS

The construct of instructional events includes both instructional interactions, between students and teachers, and classroom management. The construct in general is one best evaluated through direct observation in the classroom. However, a few aspects of classroom management can be discerned from the questionnaire.

Classroom Management

The organization of the classroom environment and the people in it can have an affect on student learning. Such organization includes the control of disruptive student behavior, scheduling of staff activities, and the physical arrangement of materials and equipment. The survey questionnaire explored staff scheduling by asking whether or not the teacher has classroom assistance, what type, and how much.

At least 71% of the teachers at all grade levels reported having no classroom assistance of any kind. This trend increased with grade level from 71% in first grade to 84% in seventh grade. When teachers did have help it was most likely to be a paid aide. While 9.8% of the first grade teachers, 8.8% of the third grade teachers and 6.9% of the fifth grade teachers reported having a paid aide, only 4.2% of the seventh grade teachers had aides. About 4% of first, third and fifth grade teachers reported that they had assistance from community volunteers. Although less than 1% of seventh grade teachers reported assistance from community volunteers, 3.2% had student (older student or peer) assistance in the classroom. Elementary level teachers reported having student help only half as frequently as the seventh grade teachers.

Teacher satisfaction with teaching techniques may have a positive influence on student performance regardless of the technique that is used. Apparently the use of a particular technique or mode of instruction is the teacher's own decision for 60% or more of the respondents. Another 25% of the teachers reported considerable involvement in selecting instructional techniques. Thus, most teachers are probably relatively satisfied with the mode they are using.

VI. PROFESSIONAL OPPORTUNITIES FOR TEACHERS

Three results of the study that were somewhat surprising to the authors were the reported low usage rate of metric measuring devices, the hand-held calculator, and general manipulatives (as well as the items teachers classified as manipulatives).[40] The 1976 index for The Arithmetic Teacher lists 18 articles on the hand-held calculator and 10 articles on the metric system.[41] Many of the workshops and inservice courses offered by state and local math teacher associations and teacher training institutions have dealt with these two topics. The Office of Education has funded projects to prepare students to use metric measures.[42] Research reports on the use of the hand-held calculator are available.[43] The hand-held calculator has been the topic of at least one national conference of mathematics educators.[44] The National Institute of Education and the American Metric Council have developed a metric guide to assist in the preparation of elementary and secondary educational materials dealing with the metric system.[45] State textbook adoption policies include mandates requiring texts to include material on the metric system.[46]

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[40] See pages 28 and 29 of this report.

[41] Jane M. Hill (ed.), "Subject Index--1976," The Arithmetic Teacher, XXII (December, 1976), pp. 669 and 671.

[42] Office of Education, Department of Health, Education, and Welfare "Application for Grants Under Metric Education Program," CFDA 13.651, (Washington, D. C.: 1977).

[43] Marilyn Suydam, "Electronic Hand-Held Calculators: The Implications for Pre-College Education," Final Report. Abbreviated Version, National Science Foundation Grant #EPP-75-16157, (ERIC #ED 127 206).

[44] Report of the Conference on Needed Research and Development on Hand-Held Calculators in School Mathematics, Conference on Needed Research and Development on Hand-Held Calculators in School Mathematics, (Washington, D. C.: The National Institute of Education and The National Science Foundation, 1977).

Given the results of the present survey, one is tempted (despite an anticipated lag between publication and the classroom) to ask, where have all the teachers been? Two questions on the survey were related to the opportunity teachers have for obtaining information on practices and recommended changes in the teaching of mathematics. The availability of resources such as the services of a mathematics coordinator or communications provided by access to a math teacher association might be expected to influence teachers' awareness of current trends.

Table 25 shows the percent of teachers' responses to the question "Does your school district have a math coordinator, math supervisor or math director?" In grades one through five 42% to 44% reported having a math coordinator. About 48% reported no coordinator and the rest either did not know or did not respond to the question. Among seventh grade math teachers 59% had math coordinators and 40% did not.

Table 26 indicates the percent of teachers in the present study who claim membership in a math-teacher organization. Although Price, Kelley and Kelley reported being amazed by the fact that 84% of the teachers they

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[45] "Metric Guide for Educational Materials," (Washington, D.C.: The American National Metric Council and The National Institute of Education, 1977).

[46] Wilson Riles, "Forward," Inservice Guide to Teaching Measurement, (Sacramento: California State Department of Education, 1975), p. 4.

Table 25. Teachers' Responses to an Inquiry About the Presence of a District Math Supervisor

Response	Percent of Respondents			
	Grade			
	1	3	5	7
Yes	41.8	42.9	44.5	58.6
No	48.1	48.1	47.6	39.8
I don't know	5.0	6.8	5.0	.5
No response	5.0	2.3	2.8	1.1

Table 26. Teachers' Membership in Math Teacher Associations

Membership Status	Percent of Respondents			
	Grade			
	1	3	5	7
Do not have a membership	96.1	95.5	92.8	64.4
Do have a membership	1.5	2.9	6.3	34.0
NCTM Membership	1.5	.6	3.4	23.7
Membership in state organization	0.0	.6	1.3	9.8
Membership in a local organization	.6	1.0	.9	7.4
No response	2.4	1.6	.9	1.6

surveyed did not belong to a math-teacher association,[47] the present study shows that approximately 95% of the first, third and fifth grade teachers did not belong to any such organization. While 70% of the seventh grade teachers included in the present study reported being math specialists,[48] less than half of the seventh grade teachers say they belong to a math-teacher association.

During the interviews, teachers were asked whether or not the school received a subscription to The Arithmetic Teacher or The Mathematics Teacher. Although 8 of the 25 schools visited did receive one or both of these journals, interviewed teachers sometimes did not know that it was being received; interviewers were sent to the school library or the teacher consulted the principal. General elementary education journals, such as Instructor, were more frequently available and more widely read.

Given elementary teachers' limited participation in math teacher associations, the results of the survey on the use of manipulatives are perhaps less surprising. However, the question of how teachers can become aware of and encouraged to use new practices and new topics remains.

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[47] Conference Board of the Mathematical Sciences, op. cit. p. 70.

[48] See page 40 of this report.

VII. TEACHERS' USES OF AND ATTITUDES TOWARD USES OF THE HAND-HELD CALCULATOR

In recent years, relatively inexpensive hand-held calculators have become widely available. As reported in the previous section, the implications of the hand-held calculator for the classroom have been much discussed and debated. "The Conference on Needed Research and Development on Hand-Held Calculators in School Mathematics" suggested that surveys should be designed to assess the extent to which calculators are now used in the classrooms at various levels.[49] Although the report, "Electric Hand Calculators: The Implications for Pre-College Education," attempted to estimate the usage of calculators,[50] little data on the actual extent of their use are available. In a position paper cited in the same report, Fred Weaver suggests that "the greatest thing we have to fear today about the calculator vis-a-vis the school mathematics curricula is the degree of fear that already exists."[51] The last two pages of the survey asked questions intended to gather information about these two issues.

An admittedly biased estimate included in one report is that "about two-thirds of the schools used calculators."[52] The same report does go on to suggest that "perhaps an estimate in the range of 25% to 50% is the best projection that can be made."[53] The results of the present survey questions on the extent of use of the hand-held calculator are presented in Table 27. As can be seen, the reported usage barely reaches the lower bound of the estimate reported above.

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[49] Report on the Conference on Needed Research and Development on Hand-Held Calculators in School Mathematics, op. cit., p.23

[50] Suydam, op. cit., p.16.

[51] Ibid., p. 42.

[52] Ibid., p. 16.

Table 27. Teachers' Usage of Hand-Held Calculators

Response	Percent of Respondents			
	Grade			
	1	3	5	7
Yes	3.9	8.4	19.4	25.6
No	94.1	90.6	79.6	73.6
No response	2.1	1.0	.9	.8

While only 4% of first grade teachers reported having used hand-held calculators, 26% of seventh grade teachers reported their use. As is noted later, teachers at each grade level covered in the present survey indicated that the calculator was appropriate for a higher grade level. Although there is some increase in usage across grade levels, seventh grade teachers were still making the same claim.

Teachers who reported using calculators were asked to indicate the ways in which, or the reasons for which, the calculator has been used. Table 28 indicates how those teachers who had used calculators reported using them. In first grade, calculators were used most frequently for drill; the next three most frequent usages were for checking, motivation, and remediation.

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[53] Ibid.

Use of the calculator for drill decreased with grade level. Above first grade the most frequent usage was for checking. Motivation and word problems were the next most frequently reported uses for calculators at the higher grade levels.

Table 28. Ways in Which Teachers Report Using the Hand-Held Calculator

Methods or Reasons for Use[1]	Percent of Teachers Reporting Use of Calculators			
	Grade			
	1	3	5	7
	n = 13	n = 26	n = 62	n = 97
For remedial students	46.2	30.7	27.4	29.9
For checking work	46.2	76.8	77.3	83.4
For solving word problems, or "real life" exercises	15.4	35.6	30.6	28.8
To provide drill in basic facts	84.6	65.3	35.4	17.5
With instructional materials specifically designed for use with the calculator	30.7	19.2	14.5	29.9
With the hope of motivating underachievers or the "turned off" student	46.2	34.5	45.1	41.2
Individual student use only	38.5	7.7	4.8	4.1
Other	7.7	3.8	0.0	0.0
No response	0.0	3.8	3.2	3.1

[1] Teachers could indicate more than one use.

Teachers who reported that they had not used a calculator were asked to indicate the factors that had influenced their decision not to use it. Table 29 shows the percent of these teachers who responded to each of the listed factors. The factors most frequently cited were that calculators were not available, that cost prohibits their use, and that teachers were uncertain about how they would affect learning basic facts. Approximately half of the teachers who responded to the "other" category appeared not at all uncertain as to how the calculator would affect the learning of basic facts. Their comments included the following.

> I feel these will curtail extremely important mental exercise and expertise.
>
> They make students lazy.
>
> We don't need them. The brain is a wonderful calculator if it is cultivated properly.
>
> Basics should be learned and stored in the brain for future use. Children should not have to depend on computers for basic facts.

The final page of the questionnaire asked teachers to indicate whether or not they agreed with a list of suggested ways in which the calculator might be used. The suggested uses included the list of justifications for use of the calculator that was prepared by the NCTM Instructional Affairs Committee[54] and the curriculum calculator-related content recommendation contained in the NACOME report.[55] These suggestions

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[54] NCTM Instructional Affairs Committee, "Minicalculators in Schools," The Mathematics Teacher, LCIC (December, 1976), pp. 92-94.

[55] Conference Board of the Mathematic Science, op. cit., p. 138.

Table 29. Factors, Teachers Not Using Hand-Held Calculators, Reported as Influencing the Decision Not to Use Calculators

Factor	Percent of Respondents Not Using Hand-Held Calculators			
	Grade			
	1 n = 317	3 n = 279	5 n = 254	7 n = 279
Cost prohibits their purchase	32.8	44.4	49.1	49.4
Theft and vandalism are anticipated	5.9	5.7	8.3	17.2
Theft and vandalism proved too costly	3.9	1.4	2.4	2.1
They do not lend themselves to content oovered at the grade I teach	46.3	16.5	15.7	16.8
No adequate instructional materials or guides are available	2.6	5.4	9.8	6.8
School or school district forbids their use	.3	1.1	1.9	2.8
I feel uncertain about how they would affect learning basic facts	26.4	37.9	45.6	47.3
I don't feel I know how to use them effectively	5.9	12.6	9.4	8.2
They are not available for use	60.0	64.4	64.1	50.1
Other	2.9	3.6	6.7	8.9
No response	2.2	.01	.004	0.0

may be found in Table 30 along with the percent of teachers who agreed, disagreed, were uncertain about, or did not respond to the suggestion. Teachers who did not respond to the calculator questions commented that they did not feel they know enough about the calculator to answer. Thus, the greater lack of response among first grade teachers might be expected since more of them reported not using calculators.

At all grade levels, teachers' responses showed a similar pattern: they were fairly positive toward all but the last two suggestions, the NACOME recommendations. These two items suggest that calculators should be used by all students past eighth grade for all math work and that they should also be used on tests past eighth grade. On these points, teachers were generally negative with seventh grade teachers most negative of all.

Teachers' written comments on the calculator section of the questionnaire show an interesting phenomenon. They indicated that they agreed in principle that the calculator could be used for these purposes (e.g., encouragement, reinforcement, checking, speed, number games, etc.); however, their comments indicated that they felt these uses were not applicable to their students. Calculators should be used "only after basic facts are mastered," "only if every student can be provided with one," "only at higher grade levels." First grade teachers said, "not in first grade"; third grade teachers said, "not in third grade"; fifth grade teachers said, "maybe for sixth grade and above"; and seventh grade teachers said, "only for advanced math or college level work." Almost all comments (and

Table 30. Teachers' Agreement with NCTM and NACOME Suggested Uses of the Hand-Held Calculator[56]

Suggested Use	Grade Level	Percent of Respondents			
		Agree	Undecided	Disagree	No Response
To encourage students to be creative and inquisitive	1	59.3	15.4	11.9	13.4
	3	62.0	22.7	9.7	5.5
	5	62.0	23.8	10.3	3.8
	7	65.2	18.2	13.8	2.9
To assist the individual to become a wiser consumer	1	54.1	19.0	13.4	13.6
	3	57.2	23.4	13.9	5.5
	5	63.0	20.7	11.9	4.4
	7	67.8	19.0	10.1	3.2
To reinforce the learning of basic number facts and properties	1	48.9	20.5	17.5	13.1
	3	58.7	13.6	22.8	4.9
	5	56.1	14.7	25.1	4.1
	7	52.0	17.4	28.2	2.4
To develop the understanding of computational algorithms.	1	40.3	33.5	9.2	16.9
	3	49.0	31.2	12.7	7.1
	5	45.1	31.0	18.8	5.0
	7	45.1	25.1	26.9	2.9
To serve as a flexible "answer key"	1	73.3	7.4	5.4	13.9
	3	79.8	9.7	5.2	5.2
	5	82.5	8.8	4.4	4.4
	7	87.6	5.8	4.3	2.4
As a resource tool that promotes student independence	1	54.3	16.6	14.6	14.5
	3	55.8	21.8	17.2	5.2
	5	52.6	25.7	17.3	4.4
	7	55.9	24.3	16.8	3.2
To solve problems that previously have been too time-consuming	1	54.0	17.2	13.1	15.7
	3	55.6	21.4	16.9	6.2
	5	55.8	16.9	22.0	5.3
	7	76.3	12.7	8.5	2.6
To formulate generalization from patterns	1	48.4	27.0	8.3	16.6
	3	50.9	32.1	8.1	8.8
	5	44.8	40.1	10.6	4.4
	7	56.7	26.9	13.4	2.9
To decrease the time needed to solve difficult computations	1	55.8	12.8	17.0	14.7
	3	62.6	14.6	16.6	6.2
	5	51.1	19.7	24.4	4.7
	7	74.4	9.3	13.2	2.9
Beginning no later than the end of the 8th grade, a calculator should be available for each student during each math class	1	17.8	27.0	40.3	14.8
	3	14.6	30.8	48.7	5.8
	5	16.7	31.3	48.2	3.8
	7	14.0	20.1	62.0	4.0
Beginning no later than the end of the 8th grade, calculators should also be available for use on tests	1	12.5	31.8	41.5	14.2
	3	7.7	28.2	56.5	7.5
	5	8.2	28.8	58.9	4.1
	7	11.6	22.2	61.2	5.0

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[56] NCTM Instructional Affairs Committee, *op. cit.*, pp. 92-94; Conference Board of the Mathematical Sciences, *op. cit.*, p. 138.

there were more on calculators than on any other part of the questionnaire) implied that the main emphasis in elementary and junior high math is on basic facts, operations and computation, and that the calculator's place in teaching could, therefore, only be supplementary -- an interesting, novel device for checking or catching a student's attention.

During the interviews, we asked teachers what, other than money, would be needed to bring calculators into the classroom. Four of the twenty-five were so opposed to the use of calculators that they could not or would not respond. Nine of the teachers said that only money was required, while two teachers felt the need for inservice training. Of the three interviewed teachers who had indicated that they were uncertain of the effect the calculator would have on the learning of basic facts or were not sure the calculator was appropriate for their grade level, all three indicated that inservice workshops would help them feel more comfortable with the calculator. One of these teachers also mentioned the need for curriculum materials. The teachers were also asked whether their school or school district had looked at or created any materials for use with calculators. Fourteen teachers were uncertain, five thought the high school might have looked at materials, three reported that calculators had been purchased for use with remedial students, two indicated that they knew no materials had been examined or developed, and one knew that the district had looked at some materials as a result of an NCTM workshop.

While it is likely that cost is a barrier to the introduction of calculators, it also appears that teachers' attitudes toward calculators and their uncertainty about the effect calculators will have on the mastery of basic facts may be a formidable barrier. The results of the present survey indicate that, at least in grades one, three and five, little use is made of the calculator. The use to which the calculator has been put is primarily one of checking. While it may not be fear that is rampant, apparently uncertainty is.

VIII. SUMMARY AND RECOMMENDATIONS

The Survey in Retrospect

In an attempt to get some feedback on the questionnaire and on our general approach in the survey, we asked the twenty-five interviewees how long it had taken them to complete the questionnaire, and whether they had found anything difficult or offensive in the questionnaire or letter.

Eleven of the teachers indicated that the questionnaire took 30-45 minutes, five teachers said it took 45-60 minutes, four said it took more than one hour, and five could not recall how long it took. Interviewees would have preferred a shorter questionnaire, a view of the developers shared from the outset (although they could not decide what items to omit).

Some items were identified as somewhat difficult, with #44 (attitude toward suggested used of the calculator) mentioned three times and #16 (use of state, district, local and text objectives) mentioned twice.

None of the interviewees found anything offensive about the questionnaire or procedures. Several indicated that they had initially felt annoyed at being asked to complete the form, but in the long run did not mind doing it. Two interviewees stated that the questionnaire was not interesting; one said that it made her question why she and the school were not doing some of the activities mentioned on the survey.

Several interviewees assumed that the interviewers were from a commercial publishing house, and, despite our denials, we received messages for some publishers. Other interviewees stated that the questionnaire was very pro-calculator and that we must be from a calculator company.

We had hoped to correlate data on standardized test results (question #30) with other reported practices. However, the question was often not answered, or was answered for an entire grade level and not for a class. This was the authors' greatest disappointment in the study. Obviously, another method of data collection would need to be used to gather this kind of information. In addition to omitting this item, we would also, in retrospect, omit items #35 and #36; they simply did not yield insightful information.

Summary

It is difficult and undoubtedly erroneous to paint a picture of the "average" math classroom. There may be several predominant types of classrooms that could be profiled, but observations would probably be the best way of developing such information. There are, however, a few trends or themes which are noted below. Some readers may find some of them disturbing while others may find them heartening.

1. The survey seems to indicate that although most teachers rely on and follow the sequence of one basic text, they often devise their own supplementary worksheets and materials. Analysis of textbook content may not, therefore, reflect content being taught. Undoubtedly some teachers are forced into creating, rather than buying, supplementary materials because of budget constraints. Are resources really being saved? To what extent are elementary classroom teachers, who for the most part are responsible for teaching several subjects, able to devise good, criterion-

relevant materials? What kinds of materials do teachers find necessary to create?

2. Evaluation for placement and assessment of pupil progress also seems to be dominated by teacher-made measures and teachers' informal perceptions. While a teacher's judgment can certainly be beneficial, the question of whether elementary teachers can devise good, criterion-relevant evaluation instruments remains. Again, are there more effective uses of teacher time? Do teachers write tests because they cannot buy tests or because they feel that published tests are not suitable?
3. While standardized achievement tests are widely used above the first grade level, they do not appear to play a large role in grouping procedures. This is in some ways not surprising in light of the survey results on item #30 and the fact that our work on other projects at school sites would seem to indicate that standardized achievement tests are frequently stored and forgotten. Although teachers using small group and individualized instruction utilize diagnostic test data, diagnostic tests were not frequently used for grouping or placing students. Also, most of the teachers who report using small group instruction regrouped students very infrequently and usually on the basis of teacher judgment and teacher-made tests.
4. While there is much talk, in math teacher association workshops and journals, as well as in the popular press, about the movement toward metric measurement and the use of hand-held calculators in the classroom, little activity is reported. While at least

some of the concern primary teachers express about the use of the hand-held calculator may be justified, the lack of activities with metric measure, reported on page 29, seems astonishing. If the introduction of metric measurement was seen by some as one way of attracting teachers' attention to what the reviewers of NAEP data have described as "the real problem," i.e., "the teaching of the basic concepts of measurement,"[57] that hope may be false.

5. Math educators have been promoting the use of concrete materials in the elementary classroom for at least fifteen years. How often do teachers use materials such as rods, balances, etc? Data on the NCTM questionnaire indicated that 57% of the second and fifth grade respondents reported using them for "less than 1/4 of the lessons," and 9% indicated that they "never" used manipulatives.[58] Data from the present study tend to confirm this relatively low rate of usage.[59] The NACOME report states that "aside from manipulative materials it does not appear that any of these other media [computer, television] is yet making large inroads in a mathematics classroom."[60] Data from the NCTM study and the present study would support the notion that television and computers have not made inroads into the classroom. However,

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[57] Thomas P. Carpenter, et. al., "Notes from National Assessment: Basic Concepts of Area and Volume," The Arithmetic Teacher, XXII (October, 1975), p. 502.

[58] Jack Price, Jonathan Kelley, and John L. Kelley, "Questionnaire" results received from Jack Price.

[59] See pages 27 and 28 of this report.

[60] Conference Board of the Mathematical Sciences, op. cit., p. 65.

the results of the present study and the NCTM study would also seem to indicate that the inroads made by manipulatives do not travel very far!

6. Many of the teachers' comments on question #44 of the questionnaire indicated that teachers thought that basic facts and computational algorithms were important and had not been learned in third, fifth or even seventh grade. However, their responses to questions concerning the amount of time spent on drill and practice and the number indicating that they regularly used a drill and practice program did not reflect their concern for this area. Do teachers really spend so little time on drill? Do they believe that "drill and practice" is a technique associated with "old math" and therefore should not be reported? If relatively small but systematic efforts were focused on drill and practice, would so many teachers report that seventh grade students do not know their basic facts? (We certainly do not wish to promote the old drill and parrot method of teaching facts, but after the building of a concept, systematic review and practice have some value.)

7. The present survey indicated that over half the elementary school teachers either do not have a district math coordinator or do not know that they have a district math coordinator. For the most part these teachers do not belong to a mathematics-teachers' organization and are not apt to see their journals. The presence of a district math coordinator could possibly have an

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[61] See Appendix F.

effect in bringing new techniques and methods to the classroom.

Recommendations

Although the survey permits some insight into the mathematics classroom, a more accurate picture of classroom practices can probably be obtained only from classroom observations or reviews of classroom videotapes. Teachers' self-reports, although not intended to be misleading, may not present an accurate picture simply because teachers' perceptions may be erroneous and/or because they do not have practice in estimating their behavior and checking their estimates against actual performance.

Questions which the survey indicates observational studies might address include the following:

> What prompts teachers who are using a variety of manipulatives, hand-held calculators and/or metric measuring devices to use them? Do they typically have support from district personnel or school principals?
>
> How do classroom teachers receive information concerning issues and innovations in mathematics education?
>
> What opportunities do in-service education programs provide teachers in mathematics education? What impact do such programs have on classroom practices?
>
> What prompts teachers to rely heavily on self-made materials? What kinds of materials do teachers create? What is the quality and effectiveness of such instructional and evaluative materials?
>
> What specific math practices lead to relatively high levels of pupil achievement? (Predominant practice, e.g., the amount of time presently spent by most schools, may not be the amount most conducive to achievement.)
>
> What diagnostic-prescriptive teaching techniques are being used successfully? What training and classroom support services are received by teachers using these methods?

APPENDIX A

RBS MATH CLASSROOM QUESTIONNAIRE

School #__________

Directions: In multiple choice items, circle the letter (or letters) preceding your answer(s).

On open ended items, write your answer in the blank.

1. In what state is your school located?

a) Delaware b) New Jersey c) Pennsylvania

2. What is the size of the community in which the school is located?

a) metropolitan (population 200,000$^+$)
b) suburb of a metropolitan area
c) city (population 25,000 - 199,999)
d) suburb of a city
e) town or rural area (population less than 25,000)

3. What would you judge to be the socio-economic status of the majority of the residents in your school's community?

a) upper b) upper middle c) middle d) lower middle e) lower

4A. At what grade level do you teach mathematics? (If you teach math to more than one class or grade level, select one class, and complete this and all the remaining items for that particular class. Also, please answer the questions in 4B.)

a) 1st b) 3rd c) 5th d) 7th

4B. If you teach math to more than one class, identify the class for which you are completing the questionnaire. Use your own school's identification (e.g. 3rd period math, 7-11s, Mr. Jones' 5th grade, etc.). If you teach math to just one class, go on to question #5.

For which class are you completing this questionnaire? __________

How many other math classes do you teach? __________

5. In which type of organizational setting do you teach mathematics?

a) self-contained classroom
b) mathematics specialist (teach only mathematics) or member of math department
c) team teaching (teach mathematics to more than one class but also teach other subjects)
d) learning resource center, teaching math only
e) learning resource center, teaching math and other subjects
f) other--please specify ______________________________

6. What is the class size of your mathematics class? _________ (If you teach more than one math class, give the class size for the class identified in question 4B.)

7. What is the average daily attendance in your math class? _________ (If you teach more than one math class, give the average class attendance for the class identified in question 4B.)

8. How many student attendance days are built into your school calendar for the present school year? _________

9. How many times per week is math class scheduled for each student? _________

10. How many minutes does your average student spend in math class on an average day? _________

11. On an average day, about how many minutes of math time are spent in each of the described activities:
    a) introducing (explanations, activities, discussions) new work? _________ minutes
    b) practicing newly introduced material ? _________ minutes
    c) reviewing homework, if any? _________ minutes
    d) practicing review concepts or drill in basic facts or algorithms? _________ minutes
    e) disciplining and managing non-math oriented activities (school announcements, classroom organization)? _________ minutes

12. On the average, how many times per week do you assign math homework? _______
    a) five times a week
    b) four times a week
    c) three times a week
    d) two times a week
    e) once a week
    f) never (skip to question 16)
    g) other--please specify _______________________________

13. On the average, how many minutes does a student need outside of class to complete his/her math homework? _________ minutes

14. On the average, what percent of the students complete their math homework? _________%

15. On the average, how often do you check each student's math homework and return the papers to each student so that he/she can tell how well he/she has done?

a) for every assignment
b) for every other assignment
c) once a week
d) once for each chapter in the text
e) once a marking period
f) never
g) other--please specify ____

16. What, if any, established mathematics objectives are available to you? Check (✓) the sources below indicating how you use them. Check all that apply.

SOURCE	USE					
	do not, to my knowledge, exist	exist, but I do not use	I use to plan lessons	I use to write skill tests	I use to write chapter or semester tests	other--please specify
state education dept. objectives						
school district objectives						
local school objectives						
basal text's objectives						
other--please specify						

17. How are students assigned to your math class?

a) heterogeneously

b) homogeneously within a single grade level

c) homogeneously across two or more grade levels

d) other--please specify ______________________________

18. During this school year, estimate the percent of math class time spent using each of the following.

whole class instruction

a) never   b) occasionally   c) 10%-20%   d) 21%-50%   e) 51%-100%

small group instruction

a) never   b) occasionally   c) 10%-20%   d) 21%-50%   e) 51%-100%

individualized instruction

a) never   b) occasionally   c) 10%-20%   d) 21%-50%   e) 51%-100%

Answer either question 19 or question 20. You do not need to answer both.

Answer question 19 only if you use whole class instruction more than 50% of the time. If you answer question 19, skip questions 20A, B, and C.

If you use small group instruction or individualized instruction more than 50% of the time, skip question 19 and go to the questions in #20.

19. At the beginning of the school year, what information did you use to select your first unit? Circle each source used.

a) results of a teacher-made group diagnostic test

b) results of a school district-produced group diagnostic test

c) results of a commercially-produced group diagnostic test

d) results of a teacher-made individual diagnostic test

e) results of a commercially-produced individual diagnostic test

f) results of a teacher-made attitude survey

g) results of a school district-produced attitude survey

h) results of a commercially-developed attitude survey

i) information on a student's permanent records

j) state assessment test results from previous year

k) standardized achievement test results from previous year

l) informal teacher assessment - yours or last teacher's

m) other--please specify ______________________________

Questions 20A, B, and C are only for those using small group instruction or individualized instruction more than 50% of the time. (If you answered question 19, go on to question 21.)

20A. On what basis do you initially form small groups or place individuals? Circle all that apply.

a) standardized achievement test results

b) school district's diagnostic test results

c) commercially-developed diagnostic test results

d) informal teacher assessment

e) teacher or school-made diagnostic test results

f) previous teacher's recommendation

g) student self-selection

h) information on students' permanent records

i) state assessment test results

j) other--please specify ____

20B. How often are math groups re-formed?

a) once a year

b) once a semester

c) once a marking period

d) once a month

e) I never use groups.

f) other--please specify ____

20C. On what basis do you regroup?

a) commercially-developed diagnostic or mastery test results

b) school district-made test results

c) school or teacher-made test results

d) informal teacher assessment

e) I never use groups.

f) other--please specify ____

21. Prior to moving on to the next math topic, what are your standards for mastery?

a) Every student must have mastered the present topic.

b) The majority of students must have mastered the present topic.

c) All but the one or two slowest students must have mastered the topic.

d) The top students must have mastered the topic.

e) other--please specify ____

22. On what basis do you decide whether or not a student has mastery of the present topic?

a) results of a commercially-developed test

b) results of a school district developed test

c) results of a teacher-made test

d) teacher judgment based on student's homework

e) teacher judgment based on student's written class work

f) teacher judgment based on oral responses in class

g) other--please specify ____________________

23. If a student has been working for several days on a difficult concept or skill in mathematics and seems to be making no progress toward mastery, what do you do? (Describe briefly.)

24. About how frequently do you formally test individual student progress in math?

a) once a week

b) once every two weeks

c) once a month

d) other--please specify ____________________

25. If a student does not pass a mastery test in mathematics, what do you usually do?

a) you tutor the student

b) give special work

c) arrange for peer tutor

d) give extra homework

e) repeat the material covered

f) other--please specify ____________________

26. How, if at all, do you use textbooks in your math class?

a) One basic text is used by most or all students.

b) One text is used predominately, but several are available and used occasionally by many students.

c) Two or more texts are used fairly evenly.

d) No basic text is used by the students.

e) other--please specify ____________________

27. If your answer to question #26 was a), b), or c), please complete this item.

List the title and publisher of the basic text series most used in your math class.

____

What is the copyright date of this text series? ____________________

What grade level or text level are you using? ____________________

28. During the present school year, what percent of math class time was used for each of the following?

commercially-developed materials ________%

locally-(school or district) developed materials ________%

materials you developed (worksheets, task cards, etc.) ________%

29. If your school administered a standardized achievement test in mathematics to students in your math class last year, give the name of the test and the level used. If no test was administered, check here ______ and go to item #31.

____ ________

(Name of test) (Level)

30. If you gave a standardized achievement test in math last year, answer the following questions.

How many students were tested? ________

How many of your students scored at grade level (within 3 months of actual grade level)? ________ students

How many of your students scored below grade level? ________ students

How many of your students scored above grade level? ________ students

31. To what extent were you involved in the selection or decision-making process for each of the following?

selecting basic math textbook or basic math program

a) not involved b) some involvement
c) considerable involvement d) sole decision-maker

selecting supplementary math materials and supplies

a) not involved b) some involvement
c) considerable involvement d) sole decision-maker

determining instructional techniques to be used in math class

a) not involved b) some involvement
c) considerable involvement d) sole decision-maker

determining the means for evaluating students' math abilities

a) not involved b) some involvement

c) considerable involvement d) sole decision maker

32. Does your school district have a math coordinator, math supervisor, or math director?

a) yes

b) no

c) I don't know.

33. How often have you used each of the following in your math class this school year?
(Check the appropriate box for each item.)

	never	less than once a month	at least once a month	at least once a week	almost daily
films, filmstrips					
television					
computer-assisted instruction (CAI)					
laboratory experiences					
hand-held calculator					
a desk calculator					
computer terminal and/or key punch for computer programming					
games and puzzles					
metric measuring equipment (meter stick, liter container, etc.)					
other manipulatives (e.g. rods, balances, counters)					

34. If you do use manipulative materials, please complete this item and item 35.
If you have not used manipulative materials this year, continue on to item 36.
How frequently do you use manipulatives in each of the ways listed? Check (✓) all that apply.

	never	less than once a month	at least once a month	at least once a week	almost daily
teacher demonstration (pupils do not handle manipulatives)					
student free exploration					
teacher-directed experience					
material available to aid student; use not required or discouraged; use has been taught					

35. List several factors that you consider to be most important when selecting a manipulative for a specific lesson.

1.

2.

3.

36. List several factors that you consider to be most important when selecting a game or puzzle for use by a specific student or group of students.

1.

2.

3.

37. When you provide enrichment for a student who has already mastered a topic, which type of enrichment do you most often select?

a) more work on the present topic but from a different context or in a different format (e.g. another textbook, game format, puzzle format, etc.)

b) work on the same topic but on the next level (e.g. larger numbers)

c) work on the class' next topic

d) work on a topic that most students will not have time to work on during the school year

e) self-selected topic

f) other--please specify ______________________________

38. Do you regularly (at least once a week) use a supplementary workbook or drill and practice program?

a) no

b) yes (Please write the title, publisher, and copyright date.)

____

____

____

39. Do you regularly have assistance in math class?

a) paid aide ________ hours per week

b) community volunteers ________ hours per week

c) older pupils (tutors) ________ tutors for ________ hours per week

d) student teacher ________ hours per week for ________ weeks

e) no other helping hands

f) other--please specify ______________________________

40. Do you belong to a local, state, or national math teachers association?

a) no

b) yes. Please specify the organization(s).

____

41. Have students used hand-held calculators in your math class this year?

a) yes Go to question #42. Skip #43.

b) no Go to question #43. Skip #42.

42. In what way(s) were hand-held calculators used? Circle all that apply and then describe briefly.

a) for remedial students

b) for checking work

c) for solving word problems, or "real life" exercises

d) to provide drill in basic facts

e) with instructional materials specifically designed for use with the calculator

f) with the hope of motivating under achievers or the "turned off" student

g) other--please specify ______________________________

Describe briefly the specific uses. If you have used commercially-made, teacher-made, or school or district-made materials, please list or describe.

____

____

____

____

43. Which factors influenced your decision not to use the hand-held calculator or prevented you from using it?
Circle all that apply.

a) Cost prohibits their purchase.

b) Theft and vandalism are anticipated .

c) Theft and vandalism proved too costly.

d) They do not lend themselves to content covered at the grade I teach.

e) No adequate instructional materials or guides are available.

f) School or school district forbids their use.

g) I feel uncertain about how they would affect learning basic facts.

h) I don't feel I know how to use them effectively.

i) They are not available for use.

j) other--please specify ______________________________

44. To what extent do you agree or disagree with each of the following statements concerning suggested use of the hand-held calculator. Circle the appropriate code after each statement.

Strongly agree = SA Undecided = U Disagree = D

Agree = A Strongly disagree = SD

The hand-held calculator can be used:

to encourage students to be inquisitive and creative.

SA A U D SD

to assist the individual to become a wiser consumer

SA A U D SD

to reinforce the learning of the basic number facts and properties in addition, subtraction, multiplication, and division

SA A U D SD

to develop the understanding of computational algorithms by repeated operation

SA A U D SD

to serve as a flexible "answer key" to verify the results of computation

SA A U D SD

as a resource tool that promotes student independence in problem solving

SA A U D SD

to solve problems that previously have been too time-consuming or impractical to be done

SA A U D SD

to formulate generalizations from patterns of numbers that are displayed

SA A U D SD

to decrease the time needed to solve difficult computations

SA A U D SD

Beginning no later than the end of the eighth grade, a calculator should be available for each mathematics student during each mathematics class. Each student should be permitted to use the calculator during all of his or her mathematical work.

SA A U D SD

Calculators should also be available for use on tests.

SA A U D SD

APPENDIX B

DISTRIBUTION OF THE QUESTIONNAIRES

Table 31. Sample Size and Return Rate

		DELAWARE					NEW JERSEY					PENNSYLVANIA					TOTAL				
		1	3	5	7	T	1	3	5	7	T	1	3	5	7	T	1	3	5	7	T
Metropolitan Area	Number Returned						8	7	7	4	26	36	39	31	32	138	44	46	38	36	164
	Number Sent						26	24	26	25	101	95	95	94	94	378	121	119	120	119	479
	Rate of Return						30.7%	29.1%	26.9%	16.0%	25.7%	37.8%	40.9%	32.9%	34.0%	36.5%	36.1%	38.6%	31.5%	30.2%	34.2%
Suburb of Metropolitan Area	Number Returned						16	15	9	12	52	59	51	51	65	226	75	66	60	77	278
	Number Sent						44	44	44	43	175	100	100	100	101	401	144	144	144	144	576
	Rate of Return						36.4%	34.1%	20.4%	27.9%	29.7%	59.0%	51.0%	51.0%	64.4%	56.4%	52.1%	45.8%	41.7%	53.5%	48.3%
City Area	Number Returned	4	5	5	3	17	29	27	37	43	136	32	32	28	42	134	65	64	70	88	287
	Number Sent	11	11	11	11	44	104	104	102	108	418	59	59	60	66	244	174	174	173	185	706
	Rate of Return	36.4%	45.5%	45.5%	27.3%	38.6%	27.8%	25.9%	36.2%	36.6%	32.5%	54.1%	54.1%	44.8%	63.4%	54.9%	37.4%	36.8%	40.5%	47.6%	40.6%
Suburb of City Area	Number Returned	6	5	7	13	31	17	19	15	16	67	26	17	27	28	98	49	41	49	57	196
	Number Sent	17	17	17	17	68	50	50	50	50	200	69	70	72	70	281	136	137	139	137	549
	Rate of Return	35.3%	29.4%	41.2%	76.5%	45.6%	34.0%	38.0%	30.0%	32.0%	33.5%	37.4%	24.1%	37.3%	39.8%	34.9%	36.0%	29.9%	35.3%	41.6%	35.7%
Rural Area	Number Returned	27	24	30	34	115	29	21	25	28	103	48	46	47	59	200	104	91	102	121	418
	Number Sent	48	47	52	47	194	49	50	49	50	198	96	96	96	97	385	193	193	197	194	777
	Rate of Return	53.6%	51.1%	57.7%	72.3%	59.3%	59.2%	42.0%	51.0%	56.0%	52.0%	49.9%	47.8%	48.8%	60.8%	51.9%	53.9%	47.1%	51.8%	62.4%	53.8%
Total	Number Returned	37	34	42	50	163	99	89	93	103	384	201	185	184	226	796	337	308	319	379	1343
	Number Sent	76	75	80	75	306	273	272	271	276	1092	419	420	422	428	1689	768	767	773	779	3087
	Rate of Return	50.2%	45.3%	52.5%	66.7%	53.3%	36.3%	32.7%	34.3%	37.3%	35.2%	47.9%	44.0%	43.6%	52.8%	47.1%	43.9%	40.1%	41.2%	48.6%	43.5%

NUMBER AND DISTRIBUTION OF QUESTIONNAIRES SENT TO DELAWARE

	Grade 1	Grade 3	Grade 5	Grade 7	Total
Metropolitan Areas	0	0	0	0	0
Cities	11	11	11	11	44
Suburbs of Metropolitan Areas	0	0	0	0	0
Suburbs of Cities	17	17	17	17	68
Strictly Rural Areas	48	47	52	47	194
Total	76	75	80	75	306

DELAWARE

Metropolitan Areas

None

Cities

1. Wilmington

Counties for Strictly Rural Areas

1. Sussex County
2. New Castle County
3. Kent County

NUMBER AND DISTRIBUTION OF QUESTIONNAIRES SENT TO NEW JERSEY

	Grade 1	Grade 3	Grade 5	Grade 7	Total
Metropolitan Areas	26	24	26	25	101
Cities	104	104	102	108	418
Suburbs of Metropolitan Areas	44	44	44	43	175
Suburbs of Cities	50	50	50	50	200
Strictly Rural Areas	49	50	49	50	198
Total	273	272	271	276	1092

NEW JERSEY

Metropolitan Areas

1. Jersey City
2. Newark

Cities

1. Atlantic City
2. Bergenfield
3. Camden
4. Cherry Hill
5. Clifton
6. Cranford
7. E. Brunswick
8. E. Orange
9. Elizabeth
10. Fair Lawn
11. Fort Lee
12. Garfield
13. Hackensack
14. Irvington
15. Kearny
16. Lakewood
17. Linden
18. Livingston
19. Lodi
20. Long Branch
21. Middletown
22. Montclair
23. Neptune
24. New Brunswick
25. North Bergen
26. Nutley
27. Orange
28. Paramus

Cities (con't)

29. Passaic
30. Paterson
31. Pennsauken
32. Perth Amboy
33. Piscataway Township
34. Plainfield
35. Ridgewood
36. Sayreville
37. Teaneck
38. Trenton
39. Union
40. Union City
41. Vineland
42. Wayne
43. Westfield
44. West Orange
45. West Trenton
46. Willingboro
47. Woodbridge
48. Belleville
49. Edison
50. Hamilton Square

Counties for Strictly Rural Areas

1. Cape May
2. Hunterdon
3. Salem
4. Sussex
5. Warren

NUMBER AND DISTRIBUTION OF QUESTIONNAIRES SENT TO PENNSYLVANIA

	Grade 1	Grade 3	Grade 5	Grade 7	Total
Metropolitan Areas	95	95	94	94	378
Cities	59	59	60	66	244
Suburbs of Metropolitan Areas	100	100	100	101	401
Suburbs of Cities	69	70	72	70	281
Strictly Rural Areas	96	96	96	97	385
Total	419	420	422	428	1689

PENNSYLVANIA

Metropolitan Areas

1.. Philadelphia
2. Pittsburgh

Cities

1. Allentown
2. Altoona
3. Boldwin
4. Bethel Park
5. Bethlehem
6. Easton
7. Erie
8. Greater Johnstown
9. Lancaster
10. Harrisburg
11. Haverford
12. Bristol Township
13. McKeesport
14. Hazleton
15. Lebanon
16. Mt. Lebanon
17. Monroeville
18. New Castle
19. Norristown
20. Penn Hills
21. Pottstown
22. Reading
23. Broomall
24. Scranton
25. Springfield
26. State College
27. Upper Darby
28. W. Mifflin

Cities (con't)

29. Wilkes-Barre
30. Wilkensburg
31. Williamsport
32. York

Counties for Strictly Rural Areas

1. Bedford County
2. Bradford County
3. Adams County
4. Carbon County
5. Potter County
6. Sullivan County
7. Tioga County
8. Union County
9. Wyoming County
10. Wayne County
11. Warren County
12. Greene County
13. Huntingdon County
14. McKean County
15. Jefferson County
16. Clarion County
17. Elk County
18. Columbia County
19. Fulton County
20. Juniata County
21. Mifflin County
22. Montour County
23. Monroe County
24. Perry County
25. Pike County
26. Snyder County

APPENDIX C

LETTERS TO PRINCIPALS AND TEACHERS

January 3, 1977

Dear Principal:

The National Institute of Education has contracted Research for Better Schools to conduct a three-state survey of mathematics teachers in grades 1, 3, 5, and 7. Since your school has been chosen as a representative institution, we would appreciate your help.

The National Advisory Committee on Mathematical Education (NACOME) has found that there is little information available regarding the programs and procedures being implemented in today's mathematics classrooms. The 1975 NACOME report expresses the need in this way:

> "Extensive and detailed information about classroom practice is an urgent need. The status of mathematical education can certainly not be known until we have far more dependable data on what actually happens in the classroom. Any attempt to link cause to the assessed effects of testing programs is suspect until such information is available." (NACOME, 1975, p. 144.)

In order to provide information about the ongoing practices in mathematics classrooms, RBS is conducting this survey of classroom practices. Only with the cooperation of those who daily implement math programs can RBS provide the National Institute of Education with the data they are seeking. Since we are distributing only a limited number of questionnaires, every response counts.

We have enclosed surveys for:

The survey may be distributed on any random basis within the above specifications. A self-addressed, metered envelope is enclosed with each questionnaire to facilitate the teacher's early return of the survey. Tabulation of responses will begin in February 1977; so the completed questionnaire should be mailed to us before the end of January. We will treat all responses confidentially.

RBS and NIE thank you and your teachers for helping to further the cause of sound mathematics education.

With Best Wishes,

Anna O. Graeber

Anna O. Graeber
Mathematics Curriculum Coordinator

January 3, 1977

Dear First, Third, Fifth or Seventh Grade Math Teacher,

WHAT WORKS IN YOUR MATH CLASS? WHAT MAKES THE DIFFERENCE? The National Institute of Education is trying to find the answer to these and other questions. At the present time math educators feel that an information gap exists with respect to the programs and procedures being used in math classrooms across the nation. Research For Better Schools, Inc., a regional educational laboratory serving Delaware, New Jersey, and Pennsylvania, has been contracted by the National Institute of Education to conduct a survey of first, third, fifth, and seventh grade math teachers in these states. You have been randomly selected by your school principal as a math teacher who falls within this survey group. If you do not teach math to grades 1, 3, 5, or 7, please pass this survey on to a teacher who does. If you teach math to more than one math class in any of these grades, select one class upon which to base all your survey responses.

We are well aware that there are innumerable demands on your time as a classroom teacher. However, we are distributing only a limited number of questionnaires; so your reply is URGENTLY needed. Tabulation of responses will begin in February 1977; so we will need your completed questionnaire mailed to us in the enclosed envelope before the end of January 1977. All questionnaires will be treated confidentially.

RBS and NIE thank you for your time and for sharing your professional knowledge with us. Together, we hope to add to the knowledge of current practices and thereby work toward strengthening math education.

With Best Wishes for the New Year,

Anna O. Graeber

Anna O. Graeber
Mathematics Curriculum Coordinator

APPENDIX D

STRUCTURED INTERVIEW INSTRUMENT,
DISTRIBUTION OF INTERVIEWS

School # ____________ Date ____________

Grade Level ________ Interviewer ____________________

Let the interviewee look at the questionnaire.

This is the math questionnaire that you filled out sometime in January or early February.

Have interviewee confirm that it is his/her questionnaire. If interviewee has questions about any of the precoding marks, explain the procedure. After that try to limit his/her use of the questionnaire to those questions where indicated.

I want to go over some of the questions with you and get more detail about some material and to get your reaction to the questionnaire.

(4) Is the class for which you completed the questionnaire an average

_______ grade class, accelerated or modified.

Ans:

(5) Are there any other comments you would like to make about the organization of your class other than

a) Its being a self-contained classroom

Ans:

b) Other than that you teach only math

Ans:

c) How is the team teaching organized?

Ans:

(7) How many students were present in math class today (or yesterday if math class has not yet been held today)?

Ans:

Is that attendance rate typical? Yes No

(8) How long is a typical student's day at your school (excluding lunch, recess)?

Ans:

(9) During a typical month, how often is math time interrupted by fire drills, assemblies, lengthy announcements, or other disruptions?

Ans:

(12) Is the homework you assign usually practice of work covered in class that day, or is it usually review of work covered sometime ago?

Ans:

Does the entire class usually receive the same homework assignment, or are they differentiated? By group? By individual?

Ans:

(15) On the average, how long after a student has completed a math assignment does he/she receive information on the correctness of his/her performance.

Ans:

(16b) Are the school district's math objectives stated as general goals or as specific instructional objectives, or both?

Ans:

(16c) Are the school's math objectives stated as general goals or as specific instructional objectives, or both?

Ans:

(16d) Are the basal text's objectives made clear to the student? If so how?

Ans:

(17) You described your math class as being grouped.

Heterogeneously - are classes formed to deliberately create a variety of ability levels -- or do other factors enter into grouping? If so what?

Ans:

Homogeneously - On what basis IQ? Past performance on a standardized test? Past teacher recommendation? What? Be specific.

(19) or (20a)

These questions refer to bases on which a starting point for the year is made - see #19 or #20. (Let interviewee look at questionnaire.)

(19a,b,d) or (20A [b,c,e])

Teacher made diagnostic tests = What areas does the test cover? (A specific area or concept which one; all 2nd grade content; all 3rd grade content?)

(19c,e,h) or (20A [c])

What commercial test was used?

(19f,g,h)

How do you use the results of the attitude survey?

(19i) or (20A [h])

What information on the student's permanent record card do you use. Which is most helpful?

(19j,k) or (20A [a,i])

Specifically what tests were used? Were the test results referred to here for this year's group of students or your last year's class? How do the results influence your planning?

(191) or (20A [d])

Your informal assessment - based on last year's teacher's comments, your own observations early in the year (get specifics)?

(22) These questions deal with your answer to question 22. (Interviewee may look at his/her answers to question 22.)

a) Are the commercial mastery tests those that come within the textbook?

If not, what tests are used (source)?

Do the tests specify a level for mastery performance?

(22) b) Are the district tests mandatory, suggested, or optional

Do the tests specify a level for mastery performance?

c) When you write the test, do you set a minimal level as indicating mastery -- or "pass-fail" mastery - non mastery based on a curve?

(27) In general, how good is the match between student abilities and needs and the ______________________________

Ans:

Poor Match				Close Match
1	2	3	4	5

How interesting to the students do the ______________________ ______________________ program materials that you have available seem to be?

Ans:

Poor Match				Close Match
1	2	3	4	5

(26) When your class has completed a unit or chapter in ______________________________ how do you usually decide what unit to do next?

a) Go to the next chapter

b) Follow a school or district developed sequence

c) Follow a sequence you developed

d) Other?

Ans:

(26) How often do you find it necessary to create, make, or adapt materials to improve the ______________________________ sequence or fill in what you find to be missing gaps?

Ans:

Never		Once a week		Almost Daily
1	2	3	4	5

(31) Does each teacher in your school use the same math basal text series.

Ans:

(33) During these last two weeks, what topics did you teach.

Ans.

During the last two weeks, what specific manipulative materials have you used? For what purpose? Demonstrate or hands on

a) Material	b) Concept or Purpose	c) Kids hands on - Teacher demonstrates

During the last two weeks, what games or puzzles (specifically) did you use?

Ans:

During the last two weeks, did you show any films or filmstrips in Math class? If so, what are titles/topics?

Ans:

(38) How do you use or incorporate ______________________ as a drill and practice program? (Seatwork, homework, during math class?)

Ans:

(43) If (g or h) are circled ask:

What factors, influences, happenings would make you feel more comfortable about using the calculator? (School district, parent approval, curriculum guides, demonstration on how to use?)

Ans:

If (i) is circled ask:

Besides money, what would be required to make calculators available? (Faculty consensus, district guides, parental approval?)

Ans:

(43) Has your school or school district looked at or created any materials for use of calculators? Where are these ideas found?

Ans:

Are any of these journals available to you at school?

a) The Arithmetic Teacher

b) The Math Teacher

c) Instructor

d) School Science and Math

e) Teacher

f) Learning

g) Other ______________________________

Do you remember how long it took you to complete the questionnaire?

Ans.

Yes No

If so, about how long?

Ans:

Do you remember any part of the questions being confusing or extra ordinarily difficult?

Ans:

Was there anything about the letter or questionnaire that you felt was annoying or offensive?

Ans:

Tell the interviewee he/she will receive an honorarium of $10.00

We need teachers name spelled as they want them on checks.

Also check data on your card.

Principal's name:

School address:

Correct only if necessary.

Thank teacher for cooperation.

Table 32. Distribution of Interview Sample by State, Grade, and Type of Community

Type of Community	State												Total			
	Delaware				New Jersey				Pennsylvania							
	Grade				Grade				Grade							
	1	3	5	7	1	3	5	7	1	3	5	7	1	3	5	7
Metropolitan Area					1		1		1	1		1	2	1	1	1
Suburb of a Metropolitan Area						1		1	1		1		1	1	1	1
City			1			1	1			1		1	0	2	2	1
Suburb of a City		1		1	1				1		1	1	2	1	1	2
Rural			1		1			1		1	1		1	1	2	1
TOTAL BY GRADE	0	1	2	1	3	2	2	2	3	3	3	3	6	6	7	6
TOTAL BY STATE	4				9				12				25			

APPENDIX E

TEXTS AND TESTS REPORTED IN USE

Code Number	Series Title	Publisher	Author	Copyright Date
01	Elementary School Mathematics K-6	Addison Wesley	Eicholz, et. al.	1964, 1971
02	Investigating School Mathematics K-8	Addison Wesley	Eicholz, et. al.	1973, 1976
03	School Mathematics 7, 8	Addison Wesley	Eicholz	1971
04	Unified Mathematics 7-12	Addison Wesley	Fehr, Fey, and Hill	1972 or later
05	First Course in Fundamentals of Mathematics 7	Allyn & Bacon	Stein	1973
06	Refresher Mathematics 7	Allyn & Bacon	Stein	1970, 1974
07	Mathematics Target System also called Meeting Mathematics K-8	American Book Company	Kane, et. al.	1972
08	Modern Math Series K-8 1st grade - Meeting Math 3rd grade - Developing Math 5th grade - Thinking with Math 7th grade - Structuring or Operating	American Book Company	Deans, et. al.	1968, 1969

Code Number	Series Title	Publisher	Author	Copyright Date
09	Heath Elementary Mathematics K-6	D.C. Heath	Dilley & Rucker	1975
10	Mathematics I 7	Ginn	Sobel & Maletsky	1971
11	Elementary Mathematics Series K-8 1st grade - One-by-One 3rd grade - Elementary Math 3 5th grade - Elementary Math 5 7th grade - Harbrace Mathematics 7	Harcourt, Brace & Jovanovich	Payne, et. al.	1967, 1968
12	Harbrace Mathematics (some color) K-8 1st grade - Subtitle One-by-One 3rd grade - Green 5th grade - Puple 7th grade - Introduction to Secondary Math I	Harcourt, Brace & Jovanovich	Payne, et. al.	1972
13	Key Ideas in Mathematics: Concepts and Applications 1 7	Harcourt, Brace & Jovanovich	Gerardi, et. al.	1971, 1974
14	Numbers and Operations 7	Harcourt, Brace & Jovanovich	Lankford, et. al.	1970
15	Exploring Elementary Mathematics 1-6	Holt, Rinehart & Winston	Keedy, et. al.	1970

Code Number	Series Title	Publisher	Author	Copyright Date
16	Holt School Math K-8	Holt, Rinehart & Winston	Nichols	1974
17	Mathematics for Individual Achievement (MIA) K-8	Houghton Mifflin	Denholm, et. al.	1974
18	Modern School Mathematics: Structure and Use K-6	Houghton Mifflin	Dancan, et. al	1970, 1972
19	Pre-Algebra 7	Houghton Mifflin	Dolciani	1970, 1973
20	School Mathematics: Concepts and Skills K-8	Houghton Mifflin	Duncan, et. al.	1975, 1976
21	The New Laidlaw Math Program K-8	Laidlaw	Gundlach, et. al.	1968
22	Spectrum Mathematics 3-8	Laidlaw	France	1973
23	Understanding Mathematics Program K-8 1st grade - Understanding Numbers 3rd grade - Patterns in Arithmetic 5th grade - Discovery in Mathematics 7th grade - Growth in Mathematics	Laidlaw	?	1972, 1974

Code Number	Series Title	Publisher	Author	Copyright Date
24	Macmillan School Mathematics Program: Developing Mathematics	Macmillan	Phillips, et. al.	1971, 1976?
25	Series M - Macmillan Mathematics	Macmillan	Thoburn & Forbes	1975
26	SRA Mathematics Learning System K-8	Science Research Associates (SRA)	DeVault, et. al.	1974
27	Mathematics Around Us: Skills and Applications K-8	Scott, Foresman & Company	Bolster, et. al.	1975
28	Foundations of Secondary School Mathematics 7	Silver Burdett	Rosshopf, et. al.	1969
29	Modern Mathematics Through Discovery K-8	Silver Burdett	Morton, et. al.	1964, 1970
30	Silver Burdett Mathematics System K-8	Silver Burdett	LeBlanc, et. al.	1973, 1975, 1976
31	Sets and Numbers K-5	Singer/Random House	Suppes	1969, 1971
32	New Dimensions in Mathematics	Harper & Row	D'Augustine	1970

Code Number	Series Title	Publisher	Author	Copyright Date
33	Modern School Mathematics: Structure and Method 7 - 1st course	Houghton Mifflin	Dolciani	1970
34	Mathematics, A Modern Approach 7 - 1st course	Addison Wesley	Wilcox & Yarnelle	1971, 1975?
35	The Random House Mathematics Program K-8 Mathematics One	Random House	Suppes	1972, 1974
36	Mathematics I	Wiley	Yarnell	1969
37	Ginn Elementary Mathematics K-8	Ginn	Scott	1972
38	New Ways in Numbers K-8	D.C. Heath	Hatzo	1974
39	Mathematics Laboratory Materials	Learning Innovations Corporation	Rasmussen & Hightower	1969
40	Mastering Mathematics K-8 1st grade - Beginning Mastering Math 3rd grade - Progress in Mastering Math 5th grade - Challenges in Mastering Math 7th grade - Discoveries in Mastering Math	Sadlier	?	1973

Code Number	Series Title	Publisher	Author	Copyright Date
41	Exercises in Arithmetic K-8	Continental Press	?	1954
42	Laidlaw Mathematics Series 3-8 3rd grade - Arithmetic 3 5th grade - Arithmetic 5 7th grade - Mathematics 7	Laidlaw	McSwain	1968, 1969
43	Individualized Mathematics System (IMS) K-9	Ginn	No individual author	1973
44	Field Mathematics Program	Field Educational Publishers	McNabb, et. al.	1974
45	Exploring Modern Mathematics 7, 8 7th grade - Book I	Holt, Rinehart & Winston	Keedy, Johnson, et. al.	1971
46	Elementary Mathematics: Patterns and Structure 1-8	Holt, Rinehart & Winston	?	1968
47	Elementary Mathematics: Concepts Properties, and Operations	McGraw Hill/Webster	Spitzer, et. al.	1967
48	SRA Elementary Mathematics Program 1-6	Science Research Associates (SRA)	None listed	1968

Code Number	Series Title	Publisher	Author	Copyright Date
49	School Math 1-8	Rand McNally	Kramer	1974
50	Mathematics I: Discovery and Practice	Harcourt, Brace & Jovanovich	Jacobs & Meyer	1971
51	Preparatory Mathematics 7	McGraw-Hill	Yager, Hirth, et. al	1969
52	Intuitive Mathematics 5-Adult	Innovative Services	?	1976
53	Discovering Mathematics 7	American Book Company	Upton	1963
54	Mathematics We Need 1-8	Ginn	Brownell	1965
55	Advancing in Mathematics 7, 8	Science Research Associates (SRA)	Topfer	1963
56	Moving Ahead in Arithmetic 1-8	Holt, Rinehart & Winston	Grossnickle	1962
57	Individualizing Mathematics 7, 8	Addison Wesley	Foley, et. al.	1970
58	Dicoveries in Modern Mathematics 7, 8	Merrill	Smith, et. al.	1972

Code Number	Series Title	Publisher	Author	Copyright Date
59	Arithmetic at Work 7	D.C. Heath	?	1955
60	Working with Numbers 3rd grade - Triangles 5th grade - Pentagon 7th grade - Heptagon	Steck and Vaughn	Benbrook, et. al.	?
61	American Arithmetic 7	American Book Company	?	1960

Table 33. Textbook Reported in Use

Publisher	Text*	Percent of Respondents Reporting Use of Text			
		Grade			
		1	3	5	7
Addison Wesley	01	5.3	14.3	10.3	.5
	02	17.5	8.1	8.8	2.1
	03	.6			2.4
	04				2.6
	34				.3
	57	.3			
Allyn & Bacon	05				1.8
	06			.3	1.8
American Book Company	07	1.2	.6	1.6	.5
	08	.3	.6	1.3	1.6
	53				.3
	61				.3
Continental Press	41			.3	
D.C. Heath	09	3.0	2.3	2.5	.5
	38	.3	.6	.6	.5
	59				.3
Field Educational Publishers	44	.3	.3		
Ginn	10				2.1
	37			.3	.3
	43	.3	.3	.3	.3
	54				.5
Harcourt, Brace & Jovanovich	11	.6		.6	
	12	1.2	1.9	2.5	.5
	13				2.9
	14				.5
	50		.3		.3
Harper & Row	32			.9	

*Numbers refer to texts listed in the preceding list.

Table 33. Textbooks Reported in Use (con't)

Publisher	Text*	Percent of Respondents Reporting Use of Text			
		Grade			
		1	3	5	7
Holt, Rinehart & Winston	15	1.2	2.3	1.6	4.2
	16	11.9	6.8	8.2	7.7
	45				2.6
	46		.3	.3	.3
	56				.3
Houghton Mifflin	17	3.0	1.3	3.4	2.9
	18	7.4	8.1	10.0	4.0
	19				1.3
	20	4.2	2.6	.6	
	33		.3		16.9
Innovative Services	52			.3	
Laidlaw	21	.3		.3	
	22			.3	1.1
	23	3.3	3.6	3.8	3.2
	42	.6	1.9	2.2	3.7
Learning Innovations Corporation	39	.3			
Macmillan	24	.6	1.0	.9	
	25	2.4	1.0	1.3	.3
McGraw-Hill	47				.3
	51				.3
Merrill	58				.3
Rand McNally	49				.5
Random House	31	1.2	1.3	.9	.3
	35	4.5	3.2	.9	
Sadlier	40		.3		

*Numbers refer to texts listed in the preceding list.

Table Textbooks Reported in Use (con't)

Publisher	Text*	Percent of Respondents Reporting Use of Text			
		Grade			
		1	3	5	7
Science Research Associates	26	2.4	1.6	.6	.5
	48		.3	.3	
	55				.3
Scott Foresman & Company	27	7.7	8.8	6.6	6.9
Silver Burdett	28			.3	.5
	29	2.1	3.9	6.3	4.5
	30	1.2	7.1	6.9	3.2
Steck and Vaugh	60			.3	
Wiley	36				.8
No Response		9.4	14.6	13.2	10.6

*Numbers refer to texts listed in the preceding list.

ACHIEVEMENT TESTS REPORTED IN USE

Test	Publisher
California Achievement Tests	McGraw-Hill
Comprehensive Tests of Basic Skills	McGraw-Hill
Cooperative Mathematics Tests: Arithmetic	Educational Testing Service
ERB (Comprehensive Testing Program) (CTP)	Educational Records Bureau
Iowa Tests of Basic Skills	Houghton Mifflin
Metropolitan Achievement Tests	Harcourt Brace Jovanovich
National Educational Development Test	Science Research Associates
Scholastic Tests	Scholastic Testing Service
SRA Achievement Tests	Science Research Associates
Sequential Tests of Educational Progress	Educational Testing Service
Stanford Achievement Test	Harcourt Brace Jovanovich
Tests of Basic Experience	McGraw-Hill
Wide Range Achievement Test (WRAT)	Bureau of Educational Research and Services

Table 34. Percent of Respondents Using Standardized Achievement Tests

Test	Percent of Respondents			
	Grade			
	1	3	5	7
California Achievement Tests	8.6	10.4	9.7	9.8
Comprehensive Test of Basic Skills	2.4	6.2	4.7	3.7
Iowa Test of Basic Skills	1.5	5.8	9.7	9.0
Metropolitan Achievement Test	11.9	10.4	10.7	10.3
SRA Achievement	1.2	4.9	2.8	3.4
Stanford Achievement	9.5	11.0	12.9	9.0
Other tests	0.0	1.5	.6	1.2
No test reported	64.9	49.7	48.9	53.0

APPENDIX F

TEACHERS' COMMENTS ON SUGGESTED USES OF THE HAND-HELD CALCULATOR

ITEMS FOR QUESTION #44*

The hand-held calculator can be used:

A. to encourage students to be inquisitive and creative.

B. to assist the individual to become a wiser consumer

C. to reinforce the learning of the basic number facts and properties in addition, subtraction, multiplication, and division

D. to develop the understanding of computational algorithms by repeated operation

E. to serve as a flexible "answer key" to verify the results of computation

F. as a resource tool that promotes student independence in problem solving

G. to solve problems that previously have been too time-consuming or impractical to be done

H. to formulate generalizations from patterns of numbers that are displayed

I. to decrease the time needed to solve difficult computations

J. Beginning no later than the end of the eighth grade, a calculator should be available for each mathematics student during each mathematics class. Each student should be permitted to use the calculator during all of his or her mathematical work.

K. Calculators should also be available for use on tests.

---

* A-I are from the NCTM Instructional Affairs Committee's justification for use of the hand-held calculator, p. 92-94 of the December, 1976 Mathematics Teacher; J & K are from the NACOME Report, p. 138.

TEACHERS' COMMENTS ON QUESTION #44

ALL COMMENTS ON A*

Agree and Strongly Agree

For a limited time

ALL COMMENTS ON B

Agree and Strongly Agree

Agree but have not done it

ALL COMMENTS ON C

Disagree and Strongly Disagree

My personal experience has shown me that continued use of calculators supplement skill in mental math not reinforce it

Based on current experience

Not 7th grade

Not for 1st grade

ALL COMMENTS ON D

Agree and Strongly Agree

Agree but have not done it

If teacher knows what they want students to understand

Disagree and Strongly Disagree

Not for 1st grade

Does not apply to third grade

ALL COMMENTS ON E

Agree and Strongly Agree

But it is very easy to use them as a crutch

Older students, perhaps 6th grade and up

Disagree and Strongly Disagree

Not for 1st graders

Not good without supervision.

*Letters refer to statements found on the previous page.

TEACHERS' COMMENTS ON QUESTION #44

ALL COMMENTS ON F

Disagree and Strongly Disagree

Not for 1st graders

ALL COMMENTS ON G

Agree and Strongly Agree

Agree but have not done it

As long as the student understands the basic computations which would be necessary without the calculator

Older students, perhaps 6th grade and up (this was said 2 times)

For every advanced math student, only college level

With older students

Disagree and Strongly Disagree

If it is that impractical why do it?

Doesn't apply

Not at 7th grade (this was said 3 times)

If the problems are impractical they would not be given

ALL COMMENTS ON H

Agree and Strongly Agree

Older students, perhaps 6th grade and up

Agree but have not done it

Disagree and Strongly Disagree

No difficult computation in 7th grade

Does not apply to 3rd grade

ALL COMMENTS ON I

Agree and Strongly Agree

If speed is what we want from mathematics

I use for computing math scores and math test standard deviation

Older students, perhaps 6th grade and up

College level only

With older students

TEACHERS' COMMENTS ON QUESTION #44

ALL COMMENTS ON I (continued)

Disagree and Strongly Disagree

Doesn't apply

Nothing wrong with a little work in 7th grade

ALL COMMENTS ON J

Agree and Strongly Agree

Assumes basic facts have been learned

Only if concept has been understood

For whom and what purpose?

Only at college level

Only with higher mathematics

For some children it is the only way they will ever be able to compute problems. It should be available

Only if student shows knowledge of basic facts, understanding of a algorithim and math concepts

Disagree and Strongly Disagree

Calculator should begin to be used with great limitations in 6th grade, unless the students are seniors in high school or college level

Not at 7th grade level

Depends on the type of mathematical work

Depends on work being done

I think it would be a misuse

I feel at 1st grade it is too soon to introduce calculators

Not at 5th grade where basics are the curriculum emphasis

I do not approve of calculators for elementary mathematics

Impractical for all students at all times, individualizing the use of the hand held calculator would seem more feasible

Not as long as basic operation is being taught

College level only

Never

Not for all work

TEACHERS' COMMENTS ON QUESTION #44

ALL COMMENTS ON K

Agree and Strongly Agree

Only if concept is understood

Only in classes such as physics or advanced math, when calculation takes up suitable test time

Depends on skills being tested. If the answers depend upon knowledge of how a computable child has mastered basics, I strongly agree

Depends on the type of mathematical work

Only if everyone has one in high school only

Depends on course

Sometimes if available for all students

If most class work is done with calculator

Depends on the content of the test

I feel high school is soon enough maybe not then. If use during classwork is permitted then students should use them on tests.

I can see many good uses for the hand held calculator, however I strongly question the students intent on its use

College level only (this was said 2 times)

Never

In puzzles or advanced math areas

With higher mathematics

This will be the only way some children will be able to compute problems

Disagree and Strongly Disagree

Children would become lazy -- too dependent on a calculator

At lower levels no, basic facts need mastery before such a policy

Not at 7th grade

I disagree

I think it would be a misuse

Not in 5th grade where basics are the curriculum emphasis

It depends what is being mastered on the test

Not for all tests - can't use on PSAT's or SAT's, not in 7th grade

Not if every one doesn't have one from 1-8

TEACHERS' COMMENTS ON QUESTION #44

GENERAL COMMENTS

I don't know enough about them to answer

I agree that all of the above are rational for use of a calculator, but in 7th grade my students are very weak in fundamentals. Exclusive use of a calculator does not strengthen in fundamentals. Occasional use is ok for me. School district can't afford 30 calculators and I won't require student to have his own.

I use calculator for motivation - after they have mastered their basic facts they may check this work with one - mastering basic facts is what 3rd grade math is all about.

The calculator can be a useful tool, but for 1st grade I do not feel it is adequate. I do realize that the slower students would benefit from using a calculator but they cannot because they have not mastered the basic operations and symbols needed to do the problem on paper first.

Difficult to answer for 1st grade teachers who have never used it.

Only one calculator (mine) for a whole class limits use.

Calculators should be used on difficult problem solving tests. Children should still be required to learn number facts.

First graders would have to be very carefully supervised, but some could learn to use them for reinforcing, as answer keys, for enriching and for independent work.

I feel that calculators are great for a resource tool but I think children use them as a dependent crutch. They should not depend on a tool for their thinking.

Does not apply to grade level, strongly disagree of use in elementary and Junior High. Perhaps beneficial for trig and physics

I believe that math skills be mastered by the student before he is allowed to use a calculator to compute. On a college level, if skills are mastered, a calculator is a tremendous time saver.

I strongly agree with all,only after a child can compute on his/her own to recognize a computer's diminished accuracy as battery power runs down after a child learns and is efficient in being able to manually work arithmetic situations. Fantastic motivation, enrichment, alternative, not a substitute.

Not applicable to third grade.